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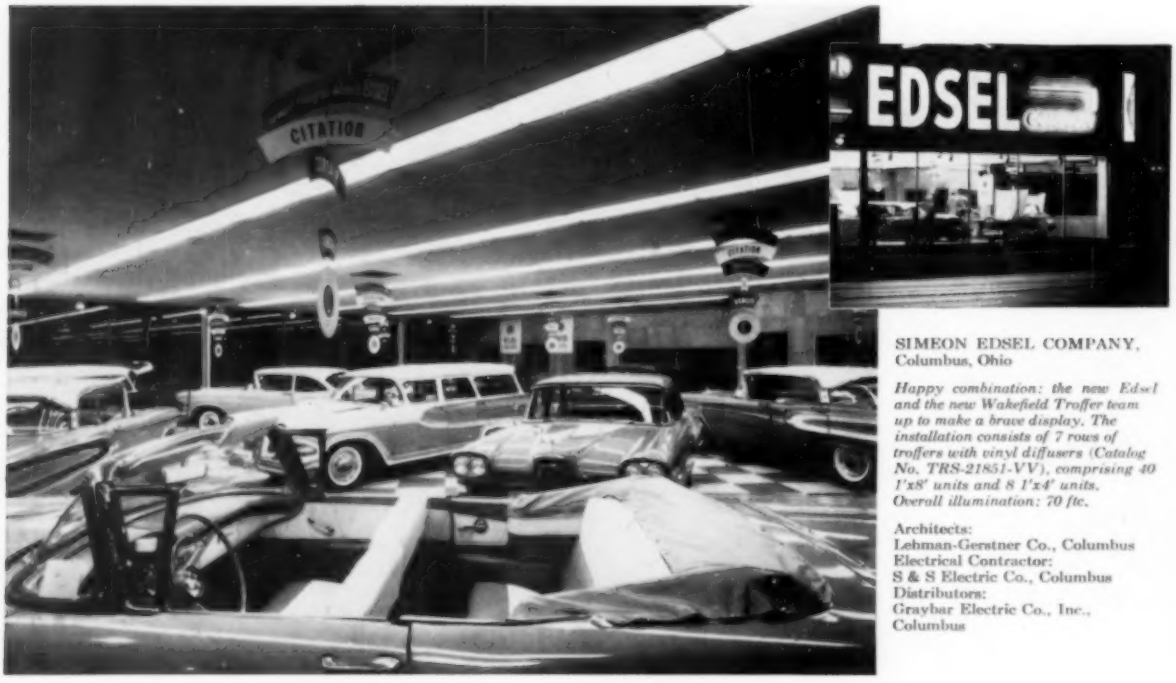

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ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

October 1957

Vol. LII, No. 10

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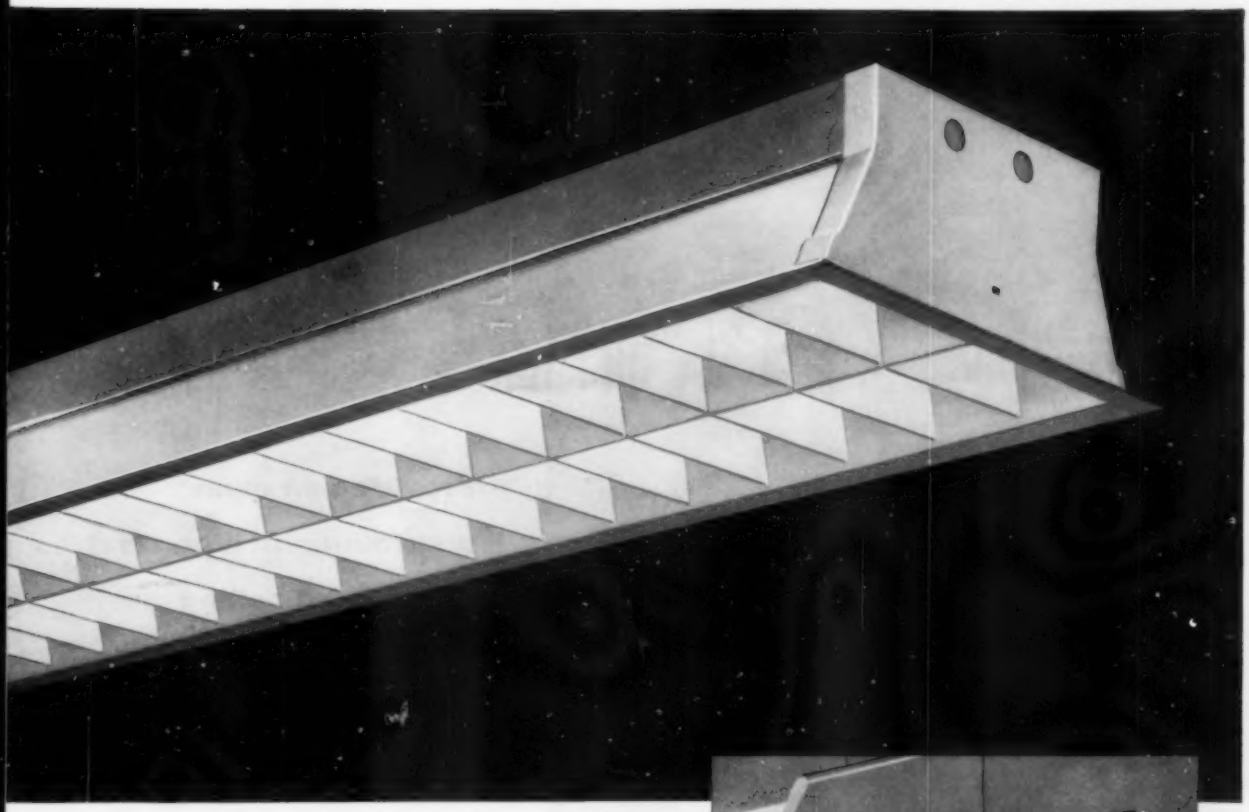

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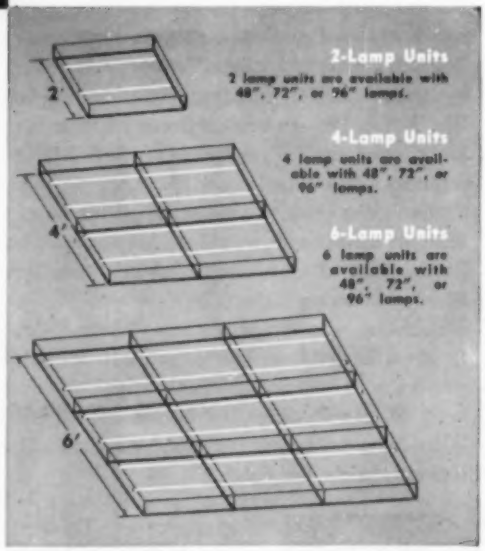
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Kirk M. Reid

President, 1957-1958

Illuminating Engineering Society

IT WOULD be hard to say in which of several fields the Society's new President is more renowned. As one of the country's leading street lighting engineers—or as a forester operating his 78-acre certified tree farm near Cleveland—or as a leader in I.E.S. affairs for many years—or as a championship tennis player, or a figure-skater of not inconsiderable reputation.

President Reid is a Fellow of I.E.S., in itself a symbol of his distinguished contributions to illuminating engineering. A list, by title, of his numerous I.E.S. Conference papers provides a hint of his original work in illumination, and especially his role in the advances made in street and highway lighting during the past 20 years. Examples: fundamental studies on highway lighting presented before the Society's National Technical Conference in 1936; the development of a Street Lighting Evaluator described before the 1940 conference; studies of traffic movement under blackouts; some of the earliest studies on fluorescent street lighting; the correlation of street lighting and street tree management—to name only a fraction of his many papers. He has, of course, been a long-time member of the Street and Highway Lighting Committee, serving as its secretary for some eight years.

Mr. Reid's many-sided interests extend apparently to his professional life also, again exemplified by numerous and varied I.E.S. committee appointments. In addition to his work with the Street Lighting Committee, Mr. Reid has also been associated prominently with such committees as Progress, Papers, Defense, Sports Lighting, and National Shade Tree Conference. Most prominent of all perhaps, is his executive leadership as an elected officer and member of Council since 1952; his work here has been an important factor in Society progress.

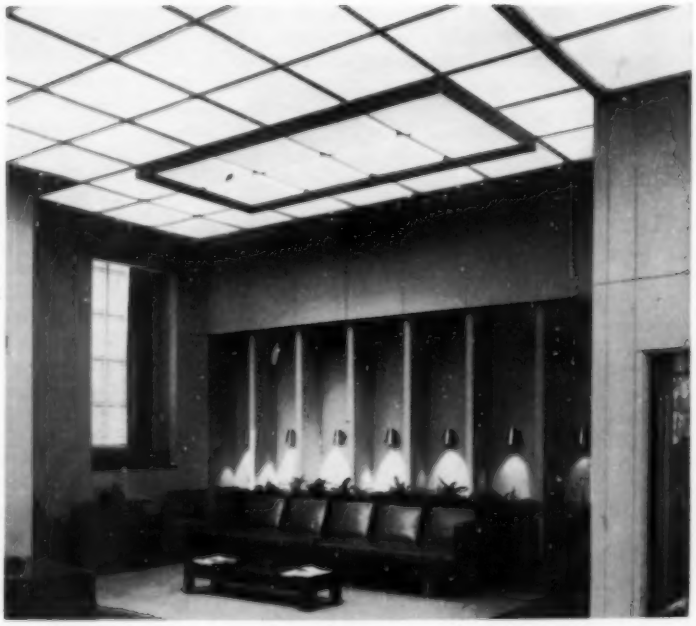
A graduate of Cornell University (1920), Mr. Reid has been for almost his entire professional career associated with the General Electric Company's Engineering Division at Nela Park, Cleveland, Ohio. His present assignments, as a Senior Illuminating Engineer with General Electric, include Supervisor for Street Lighting, Photometric Laboratory, Field Investigations on Filament Sources, Consultant on Filament Sources, and Liaison with Manufacturers of Filament-Lamp Accessories.

No introduction of Kirk Reid would be complete without mention of his prowess as a tennis player. This is his fiftieth year as a tennis player — and still he wins important awards! Among some 100 trophies is that won just this past summer, and in 1956 three trophies were added to the impressive collection. Many of his wins in tournament competition have, in fact, come during recent years, at an age when most tennis players turn to less strenuous activities. During his college years he played No. 1 on the Cornell team; during the 1920's and early 1930's he compiled a tournament record rarely equalled by any tennis player. He won the Ohio State Open singles championship five times, the doubles seven times, and also won the New York State Open singles championship once. The Greater Cleveland singles championship fell to him ten times, and the doubles twelve. During this time Mr. Reid was ranked American's No. 13 player. During the past decade his best National Rankings have been No. 3 in men's senior singles, No. 5 in father-son doubles, and No. 6 in men's senior doubles. Tennis greats such as Bill Tilden, the great Australian champion J. O. Anderson and Pat O'Hara Wood, captain of the Australian Davis Cup team (whom incidentally he defeated), have been his tennis opponents. One of his longest competitive sets was against Bill Tilden in an exhibition match in 1925 at the Cincinnati Tennis Club. Tilden finally won, 6-3, 16-14.

Kirk Reid brings to the Presidency of I.E.S. and to his leadership of I.E.S. progress, a stamina and skill similar to that which has enabled him to compile such a sports record. Society members may look forward to a vigorous and successful administration of their affairs this coming year.

Ceiling interest, with color, form and texture, adds a pleasing element to the functional characteristics (lighting, acoustics and air-conditioning) of this installation. In a planned and pleasing pattern, white plastic panels combined with pink plastic panels, have been outlined by blue acoustic baffles. In the background, yellow baffles with white panels form another pattern. Lighting levels are of the order of 75 footcandles in the working area; lower in the lounge and waiting areas (foreground). Installation is in the Personnel Department of the New England Mutual Life Insurance Company, Boston.

Ceiling Interest . . .



Applicant's waiting area. Ceiling pattern, using colored acoustical baffles, is integrated with floor plan of furnishings. Lighting levels here are lower than in working area, to provide a restful, friendly atmosphere.

Higher illumination levels (75 ft-c) provide a more formal, efficient feeling, to define the working area. Ceiling interest is added by yellow acoustical baffles in a planned and pleasing design. Note high vertical illumination on mural, where luminous plastic panels extend from wall to wall.

can add pleasantness to lighting

By GEORGE W. CLARK

JUDGED from our normal standards for footcandles and footlamberts, properly-designed extended area lighting systems completely fill the bill. Whether wall-to-wall or in panels, they contribute the required amount of illumination in a quite acceptable manner. They provide the "clean ceilings" so desired by architects. In addition, they often provide certain economic and esthetic advantages not otherwise obtainable. However, they *can* be monotonous.

In a paper* presented before the I.E.S. National Technical Conference in Atlanta last month, a plea was made — again — for more dynamic lighting design. Pleasantness—flexibility—ceiling interest —greater emphasis to esthetic and psychological aspects of illumination design — were suggested. We have reached the point in lighting practice where we should do something more than design installations which are considered good solely because they do not violate accepted rules and codes. We should be working to provide installations which are positively pleasant as well.

For the installation shown, the Personnel Department of the New England Mutual Life Insurance Company in Boston, the architect particularly wanted such a plus factor. And the management wanted an outstanding "first impression" for prospective employees. With no sacrifice of good lighting principles, *pleasurable* lighting has been achieved by applying as well several architectural principles to the wall-to-wall system. These elements of Color, Form and Texture, used to create Integration, Function and Character, are not new. But their application to the ceiling, and especially as a feature of the lighting system, has been fairly rare. Actually, the ceiling is a "natural" for the introduction of such elements to an interior; extended area lighting systems provide a natural opportunity to do so.

*"Footcandles, Footlamberts — What Next," by George W. Clark and Richard E. Harz, I.E.S. 1957 Conference Paper No. 5.
AUTHOR: Sylvania Electric Products Inc., Wheeling, West Va.

Color for creating moods and stimulating responses is not new to the lighting field. We've recognized its value for years. Our interest, however, has generally been confined to the relationship of the spectral emission of our light sources and the spectral reflectance characteristics of the wall paint, floor finishes, furniture, merchandise or whatever. Why not put color in the ceiling? Not as a solid mass, but for accent and as an element of overall ceiling design.

For the New England Life installation, Color has been used as one element of *pleasurable* lighting. In the front section of the area, white shallow double panels of the extended area lighting system have been used together with pink deep double panels in rectangular areas outlined by blue acoustic baffles. Luminous plastic circles within the opaque perimeter panels add a touch of brightness to the area and create an unusually pleasant design. As a further esthetic design consideration, luminaire rows are alternately wired so that the illumination level can be changed when desired.

In the back section of this area (see photograph) white shallow double plastic panels are used with a pattern of yellow acoustic baffles. The rectangular pattern designs featuring pink panels and blue baffles highlight the areas by integrating the ceiling with the floor layout, that is, furniture, rugs, etc. Acoustic baffle designs in the general office, coupled with higher footcandle levels, provide a more formal, efficient air to define the type of area and work being done, whereas in the "visitor" section, lower footcandle levels suggest a restful, friendly atmosphere.

All of the areas of this T-shaped space are given coherence through the medium of a lighting system having a common structure and module throughout, yet each is individualized by means of the appearance elements to accept its separate function and character. Furthermore, this has been accomplished with standardized equipment which provides "custom" appearance at relatively low cost. This same feature also makes practical periodic changes to give the installation a "new look."

Air diffusers, it will be noticed, are located in the perimeter panels, thus adding another functional value, without disturbing the overall design concept.

The efficiency with which lighting principles are met with extended area lighting is so well known that this phase has not been expounded here. In the New England Life installation, the excellent lighting results in the general office area and front center section, are from two-lamp strip fixtures on three-foot centers. Illumination is 75 footcandles maintained. In the applicants' waiting area and lounge area, "outrigger" type of luminaires with lamps on two-foot centers provide 50 footcandles maintained. Structural height of the area varied from 15 feet to 19 feet; plastic ceiling height is 12 feet 6 inches (back area) and 14 feet 6 inches (front area). The plenum, which contains pipes, ducts, etc., is, of course, painted a high reflectance white.

In the back office area where the wall mural is located (see photograph), the luminous plastic panels extend from wall to wall. The resultant uniform brightness distribution and high vertical illumination level adds significantly to the detailed scene of the mural design.

It might be said, however, that it is the esthetic design considerations which have made this installation outstanding. In addition to comfortable illumination which conforms to our highest lighting principles, "positively pleasing" lighting has been obtained with ceiling interest, and the application of architectural principles—Integration, Function, Character by means of Color, Form and Texture.

Acknowledgements

Designer of the lighting system was Peter Muller-Munk Associates, Pittsburgh, Pa. Interior design was by Wilton H. Hoag, purchasing agent and A. Osborne Willauer, architectural consultant for the New England Mutual Life Insurance Co., Boston.

I.E.S. Officers and Committee Chairmen

Photos of I.E.S. National Officers and the Section and Chapter Chairmen begin on page 543. Listing of these officers begins on page 25A. The I.E.S. Committees and their Chairmen are listed, beginning on page 16A.

INSTALLATION AT GEORGE I. EAKLE HAT SHOP, 1628 MARKET ST., PHILADELPHIA, PA.

Lighting a Men's Hat Store

LIGHTING OBJECTIVE: To provide general and supplementary lighting for displaying and selling men's hats and accessories.

GENERAL INFORMATION: The sales and display area of this store measures approximately 17 by 74 feet with ceiling heights of 9 feet 8 inches in the front portion and 8 feet 10 inches in the rear portion. Although hats are the specialty of the store (hats of 30 different manufacturers are stocked), shirts, sportswear and accessories are also sold. Colors and reflectances of the major store surfaces are:

ceiling (acoustical tile)	white	70% RF
floor (asphalt tile)	white with tan streaks	28% RF
woodwork (painted)	tan	22% RF

INSTALLATION: General illumination is provided by ten surface mounted plastic bottom fluorescent luminaires (Smithcraft catalog No. 10496), each equipped with four 96-inch T-12 deluxe cool white slimline lamps, and by twenty recessed units with asymmetric reflectors and eccentric louvers (Pittsburgh catalog No. 55-5 (UL), each equipped with one 150-watt A-23 clear lamp. These units are located as shown in Fig. 2.

Supplementary lighting for hat selection is provided by a 76-foot long custom built suspended luminaire as shown in Fig. 3. This unit is equipped with symmetric reflectors and nineteen 40-watt T-12 deluxe cool white fluorescent lamps. Fitting mirrors attached to this custom built unit permit

(over)

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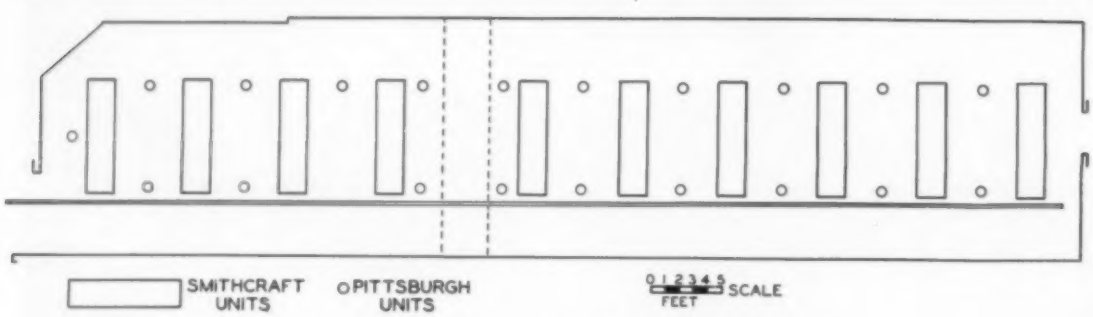

Figure 2. Plan view showing location of lighting equipment.

the customer to view a hat on his head without moving to one of the fitting mirrors.

Illumination and brightnesses after the lighting had been in use for 800 hours are as follows:

Illumination	
average general	100 ft-c
on hats, top shelves	70 ft-c
middle shelves	75 ft-c
bottom shelves	35 ft-c
wall opposite hats	55 ft-c
Brightnesses	
fluorescent luminaires (ceiling) at 45°	480 ft-L
incandescent luminaires at 45°	520 ft-L
ceiling	14.5 ft-L
floor	18.5 ft-L
woodwork	9.0 ft-L

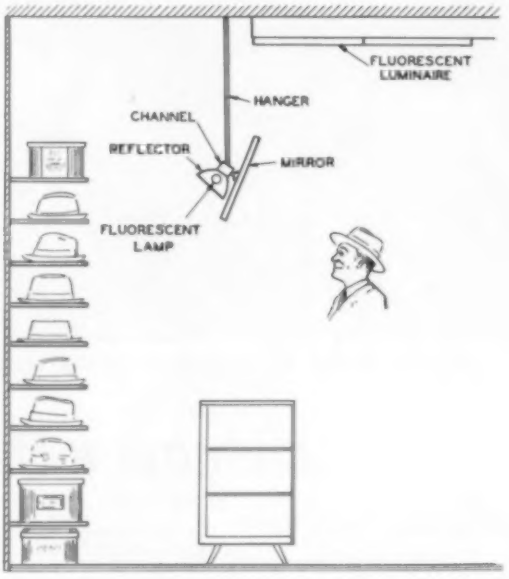

Figure 3. Section through store showing relative location of customer, mirror, luminaires and hat display.

Lighting designed by Paul Scherr, Architect, Philadelphia, Pa., and George T. Anderson, Jr., Philadelphia Electric Co., Philadelphia, Pa.

Lighting data submitted by George T. Anderson, Jr., Lighting Engineer, Philadelphia Electric Co., Philadelphia, Pa., as an illustration of good lighting practice and to aid in the design of similar installations.

Published by the Committee on Publications of the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

University of Moscow, completed in 1953

Impressions of

Illumination in Russia

By W. P. LOWELL, JR.

WHAT'S the lighting like over there? Ever since my return from seven days in Russia this past July, this has been the question most frequently asked, at least by my lighting colleagues.

My purpose in Russia was to attend the 32-country International Electrotechnical Commission's annual meeting, this year held in Moscow, July 2-12. It was my good fortune to attend this meeting as U.S.A. delegate to Committee 34, Lamps and Related Equipment. Committee 34 and its subcomittees work on the preparation and constant improvement of international specifications for lamps, lamp-holders, fluorescent auxiliaries, etc. IEC business sessions, of course, took most of my time, but within the opportunity available I observed as much of lighting practice as possible. It would be unfair to draw broad conclusions on observations made during one week in a country, but certain impressions were inescapable.

Public Buildings

Since our arrival in Moscow was in the early evening, our first lighting impression was in the Hotel Moscow. This was poor. The main lobby was very dark and dismal in appearance, and the elevator and corridors not much better. Our suite of rooms (which included living room about 18 by 30 feet complete with grand piano) made a much better impression with its chandeliers, floor lamp with silk shade, and desk lamp. Not too unlike the condition found in some American hotels, the shade was red, with about 25 per cent transmission. One of the two 40-watt bulbs in the desk lamp was missing, but a little "bulb snatching" took care of that. The bedroom had an overhead chandelier and a single reading lamp on a table too low to be of much value. This too may sound familiar to travelers anywhere.

Moscow University, where the IEC meetings were held, was one of the highlights of the trip. The Russians have good reason to be proud of this huge building, completed in 1953. It is well planned, on a site overlooking the city, and in my opinion quite well lighted. The lighting, I would say, is comparable in quality to that which would have been used in U. S. college buildings of the same era. Fluorescent lamps are used throughout. A typical classroom had four-lamp 40-watt luminaires on approximately 8 x 10-foot spacing. Luminaires were mounted on white acoustic ceiling, and were well shielded with plastic sides and plastic louvers. Corridors and halls were well lighted with plastic shielded units, and the elevators, which were some of the fastest and smoothest I have ever used, had good fluorescent lighting. My only criticism of the University lighting would be the

AUTHOR: Sylvania Electric Products Inc., Salem, Mass.

maintenance, which was poor. Fixtures were dirty and a few lamps and plastic shielding pieces were missing. Poor maintenance seemed to be typical of all Russian lighting.

The Great Hall of the Kremlin was the outstanding exception in that respect. Here, every crystal glistened; every lamp was clean and working. The Great Hall is about as long as a football field, and half as wide, and the walls are of white marble. Lighting is by six huge crystal chandeliers with electric candles, plus a row of the same candles on about 10-inch centers on a cornice ledge or shelf all the way around the hall. This fabulous place was the scene of a most impressive reception, buffet dinner and entertainment which climaxed our visit.

Russia is very proud of its subways, and has every right to be. The stations are large, with marble and tile walls of light colors, and are clean and reasonably well lighted. The cars are large, clean, and fairly well lighted and run on fast and frequent schedule. Escalators are the fastest I have ever been on.

Street Lighting

About 99 per cent of street lights are incandescent. The main streets of downtown Moscow and Leningrad were well lighted for the traffic they carry. There seemed to be little use of reflector or refractor equipment, but poles on both sides of the main streets, on 80- to 100-foot spacing, carried one, two or four 500-watt incandescent lamps with diffusing glassware. Mounting was about 25 feet or more above the pavement. Secondary streets were another matter. Here 300-watt and smaller lamps were suspended in various types of reflectors and glassware, usually over the center of the road, and about 20 to 25 feet above the pavement. Again, it seemed adequate for the light traffic.

Fluorescent street lighting has not been very successful because of the very low temperatures of the Russian winters. Some secondary streets have center-suspended luminaires consisting of four 30-watt fluorescent lamps, one above the other, each enclosed in its own glass cylinder for heat warmth, and cross-wise of the roadway. Results were not too good, particularly as maintenance was poor, with many lamps out of service.

A principal parkway is lighted by plastic enclosed luminaires, each containing five 80-watt fluorescent lamps, on 80-foot centers. This would have been excellent illumination for the one-way traffic if the fixtures had been well maintained.

Mercury lamps for street lighting are strictly experimental in Moscow. One small square near the center of the city has four color-corrected lamps, each reported as 500 watts. Because it is an experiment, these lamps are in opal glass, open bottom units, with the lamps extending below the glass, so we would rate them as rather glaring. Illumination level was adequate.

Floodlighting

Moscow abounds with statues and fountains. Many of these are floodlighted, and so, of course, are the Kremlin and the buildings of Red Square. This lighting seemed reasonably conventional and well done, although the floodlighting seemed to be done by "packing in all the lamps that the traffic would bear." We were told of a new technique in planning floodlighting: a scale model of the object to be lighted is coated with fluorescent paint, then lighted with "blacklight" until the appearance satisfies the architect or other authority. The result is then translated into required luminaires by instruments and formulae. Details of this explanation were not clear, perhaps due to difficulties of translation.

Store Lighting

We had been told that display lighting was not used in the stores of Moscow, because of lack of competition. Such is not the case. We found to our surprise many store display windows lighted at night. Judged by our standards, the lighting was rather poor, but it was able to compete with other stores and with the street lighting.

There was some interior lighting of individual displays or departments, but the general overall lighting of GUM, the giant state-owned department store, was provided primarily by the sky, through an all-glass roof and vast light-wells. Business was confined to the first floor and second floor mezzanine, all lighted by daylight from above.

Office Lighting

No invitation was given to enter offices of the Kremlin or other government buildings, but through the windows could be glimpsed sketchy overhead lighting. This was usually round white glass globes using, for a guess, 200-watt lamps. Local lighting was available at most desks, and was in wide use.

Industrial Lighting

The only industrial plant I visited was "Svetlana," which manufactures radio tubes, semiconductors and large transmitting or power tubes. Fairly good local lighting was provided for most operations, but the general lighting was very poor.

Lighted window display in Moscow store ▶

Since we visited this plant during daylight hours, very few lamps were on but fixtures were of white opal glass that could not have contained larger than 200-watt bulbs. Further, they were on almost 20 by 20-foot centers. This was out of keeping with the balance of this plant, which appeared to be reasonably modern as to equipment, cleanliness and layout.

Residential Lighting

Residential lighting in Russia is still unknown to us, because we were not invited into any homes. We did not have nerve enough to invite ourselves, and the Russians were too shy to ask us. From conversations with guides, interpreters and others, the impression was that home lighting was chiefly 40-, 75- and 150-watt incandescent lamps concealed inside large silk shades but otherwise bare, the shades usually red or orange. This was borne out by the merchandise on display in the "lamp department" of GUM. Some small metal and glass shielded portable and fixed units were available, but the women were buying silk shades. Electrical appliances, such as space heaters, irons, toasters, coffee-makers and vacuum cleaners were being sold at prices comparable to ours, but with style and quality of several years back. Watt-hour meters were also on sale, for what purpose I could not discover.

General Observations

Russia has no existing official standards of lighting, but Soviet engineers say they are preparing the first set of Russian standards for release next January. Some 400 engineers and technicians are now working at the Illumination Research Institute, and great plans are being made for Codes of Illumination and for vast improvements in the relighting of Russia. At present, illumination levels and quality of lighting considerations, are far lower than in the United States.

Incandescent bulbs are by far the most widely used type of lamp. There is little use of fluorescent, and mercury vapor lamps are still experimental. Lamps and fixtures appear not to be maintained on a "program" basis. Daylight appears to be used in preference to electric light.

In the lamp manufacturing field, the impression was that the rate of production is considerably less than America's lamp industry. On lamp bulbs, the rate of production of a Russian machine would appear to be about half, or less, of an American machine. In terms of volume, it is interesting to note that the USSR lists only 11 lamp manufacturing plants in the entire nation. Engineering design of Russian lamps and electrical products is not as advanced as that in the United States, judging at least from the products seen. Types of lamps on sale in the large Moscow store look like copies of 25-year-old U. S. models.

This may seem a gloomy picture of lighting in the work-day world of Russia. Perhaps it is, but it should be remembered that everything is done to a different standard of speed, traffic and human endeavor. Also, whether it has any significance or not, I must report that I saw no Russian of engineering or technical grade wearing eyeglasses! And finally, the future of relighting in Russia seems promising, with considerable work in this direction being done at the Illumination Research Institute.

Fluorescent Strip Runway Lighting

By S. C. PEEK

Introduction

Incandescent lamps are well suited for use with reflectors of circular symmetry and the combination is useful for illuminating areas of roughly equivalent length and breadth. Rectangular areas with one dimension relatively greater than the other can be illuminated either by a multiplicity of concentrated luminaires as is now common in street lighting or can utilize a linear light source with an appropriate reflector. This paper is concerned with the linear light source system. Although the literature contains several pertinent articles[1,2,3] it is felt that the subject is worth reviewing for two reasons:

(1) the advent of new higher brightness fluorescent,

(2) the real need in airport runway lighting.

Although electronic landing aids have landed aircraft without any visual contact, the need for visual guidance in both the approach and touchdown stages of a landing has been well established by the CAA, the airlines and the military. Approach lighting, or lighting that leads the pilot to the runway is now becoming standardized. The new proposed system involves bar lights comprising reflector lamps and electronic flash units which extend out into the approach area 3000 feet and are placed parallel to the centerline of the runway. Runway lighting methods, however, are by no means settled. The most commonly used runway lights which line either side of the runway serve only as beacons and the resultant "black hole" is becoming increasingly dangerous as the "jet age" approaches. These new aircraft not only land at higher speeds, but are less stable just before touchdown. These factors, coupled with the very poor engine efficiency at low altitudes which puts a penalty on missed approaches, makes better runway lighting imperative.

It should also be recognized that a row of bar lights and condenser discharge units provide good azimuth guidance but do not give height information. While the pilot is in the approach phase of the landing, good azimuth information is of major concern but when he is nearing touchdown, height guidance takes over in importance. Fig. 1 shows the bar light and condenser discharge system as being used by a SAC B59. The good identification, azimuth and roll gudiance are clearly evident but Fig. 2 illustrates what greets the pilot at the runway when he gets ready for touchdown. One approach to this problem is to fill the "black hole" with additional beacon type lamps. Naturally such lamps must have a translucent covering and be imbedded in the runway surface. While this system narrows the "black hole" and may provide more precise height guidance, it becomes necessary for the pilot to estimate the location of the runway when this concept is employed. If the runway could be illuminated, no mental gymnastics would be required. The runway surface could be seen directly. Furthermore a series of lights offers a temptation to the pilot to allow his eyes to jump from one light to the next instead of picking a point on which to fixate and then guide the aircraft

Figure 1. Centerline approach lighting at SAC Air Force Base, March Field, Calif.

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 9-13, 1957, Atlanta, Ga. AUTHOR: Sylvania Electric Products Inc., Salem, Mass.

thereto. The latter procedure has been recognized as being far superior and it is possible with floodlighting.

Fig. 2 is a photograph of a model built to demonstrate the "black hole" and Fig. 3 shows the same model equipped with floodlighting. It was hoped that the same kind of improvement could be obtained on an actual runway. We now believe that these hopes have become a reality.

Floodlighting of runways is not a new concept. It was tried back in the twenties. In those days, however, the correct tools for doing a good job were not available. The recent developments in very high output (VHO) fluorescent lamps provided a means of adequately floodlighting a runway from the low elevations required by propeller clearance. It was essential that the floodlighting fixture must:

(1) provide adequate runway illumination,
(2) be frangible so that an aircraft would not be damaged in the event that it left the runway,
(3) have little upward light that would contribute to glare.

A high brightness fluorescent lamp in a light aluminum fixture employing a reflector large compared to the lamp diameter and of accurate contour satisfies the above requirements. It should be emphasized that fluorescent lighting is generally thought of as relatively uncontrolled. Often the lack of control results from the use of several lamps with a single reflector. The advent of VHO lamps has made it possible to obtain the equivalent output of three or more standard lamps in a single lamp. This provides opportunity for control in one dimension unobtainable from multiple lamp fixtures. Such control means putting light where it is wanted, with little glare.

Grazing Light Considerations

Since the luminaire is low, the emitted light will illuminate the runway at a grazing angle. This type of lighting produces a completely different effect than lighting from higher elevations.

Protrusions or minor changes in the contour of the runway are greatly exaggerated. The texture is vividly brought out and, therefore, contributes markedly to height guidance. Thus the presentation depends on no special previous training of the pilot to be fully effective.

Although the brightness of a perfectly diffuse surface is independent of the viewing angle, the angle between it and the incident light does affect the brightness. At grazing angles of incident light, horizontal perfectly diffuse surfaces are ineffective.

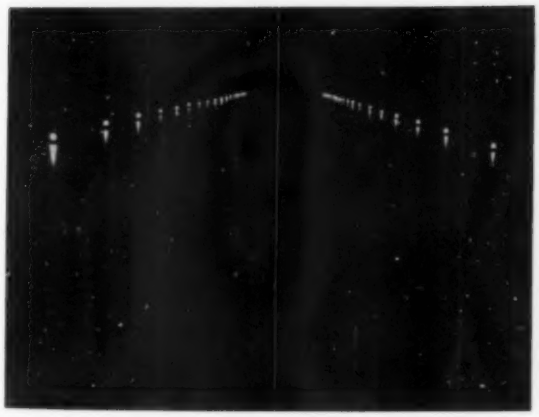

Figure 2. Picture of a model runway, demonstrating the "black hole."

Fortunately, most diffuse surfaces become predominantly specular in nature at low incident light angles and low viewing angles; therefore, the pilot can see what amounts to reflected images of the light source. A second effective surface condition results from any raised areas of the runway such as stones, tar expansion joints, or other nearly vertical portions. Such vertical portions have relatively high brightness as viewed by the pilot, even though their surfaces are diffuse. In these cases the light is striking the surface at angles more nearly perpendicular than would be the case if the surface were horizontal. The runway can thus be marked by purposely creating vertical surfaces upon which the light can fall.

The need for floodlighting has been explained and the possibility of using grazing angle light has been demonstrated. A practical luminaire which uses this concept will now be described.

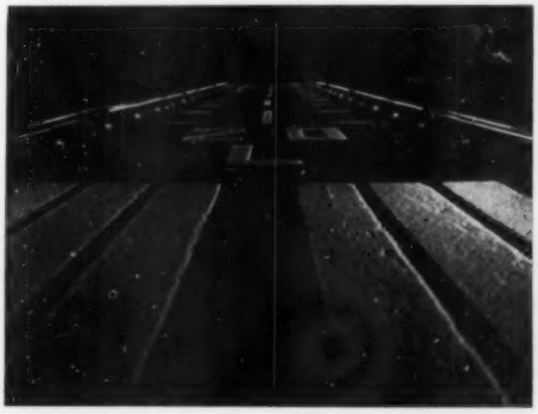

Figure 3. Model runway, demonstrating an illuminated runway at approach angles.

A Practical Luminaire

As mentioned earlier, high brightness fluorescent lamps of relatively small diameters are now available. The VHO 25 reflector lamp has a surface brightness of 4700 footlamberts, produces 12,000 lumens and draws 200 watts from the line. If such lamps were run along either side of the runway in continuous strips, 250,000 lumens would be available per 100 feet of runway. It is essential that these lumens be spread out over the runway surface and not up into the pilot's eyes. The luminaire described in this paper accomplishes this by employing a reflector large compared to the lamp diameter, and of accurately controlled contour. Fig. 4 shows a schematic view of the reflector-lamp relationship.

The reflector contour and lamp position are such that a light ray originating from the front side of the lamp is reflected out horizontally across the runway. Rays originating from any other part of the lamp are reflected below the horizontal. All parts of the fixture other than the reflector and glass front are painted black to absorb unwanted rays which might produce glare. The front glass is in such a position that rays reflected from its inner surface will be absorbed by the blackened surfaces of the fixture.

The reflector has been coated with aluminized Mylar producing a 75 per cent reflectivity and offering good resistance to corrosion or other dulling effects. The contour needed to obtain the proper results has been determined both graphically and mathematically and is not a parabola. It approaches a parabola, however, as the lamp position is moved farther away from the reflector. It is

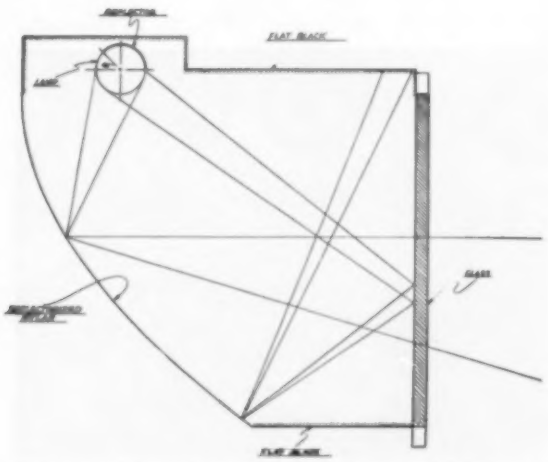

Figure 4. Schematic drawing of the lamp and luminaire showing how the various rays are reflected.

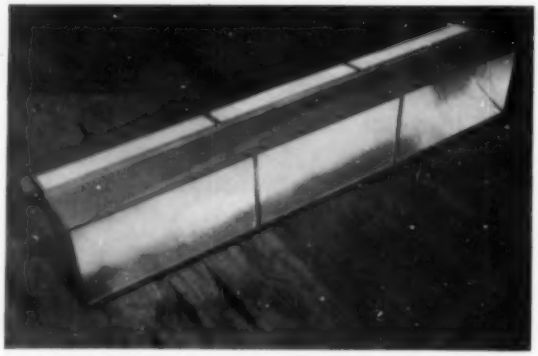

Figure 5. Luminaires as used at Andrews Field.

essential that the contour be very accurate, which is difficult to maintain in a fragile fixture. Production techniques have been worked out to accomplish this.

Fig. 5 shows a photograph of an early luminaire which was used on an actual installation. The top glass diffuser has been eliminated. The luminaire was made of .025-inch aluminum and was fragile enough to cause no damage to an aircraft in the event that it left the runway. The fixture was weather proof and stood up satisfactorily in a wind and hail storm with gusts up to 90 miles per hour.

One hundred seventy-two of these fixture were installed at Andrews Field in Maryland by the CAA for flight evaluation. Some photometric tests were also made and the results are shown in Figs. 6 and 7. Fig. 6 indicates the brightness of a cement runway surface as a function of the viewing angle. If the surface were completely diffuse the brightness would be about 1.75 footlamberts at all angles. The fact that the brightness goes up at small angles points out that the surface has become more specular at such angles. It is fairly well established that a good pilot will go into a stare with his eyes fixed

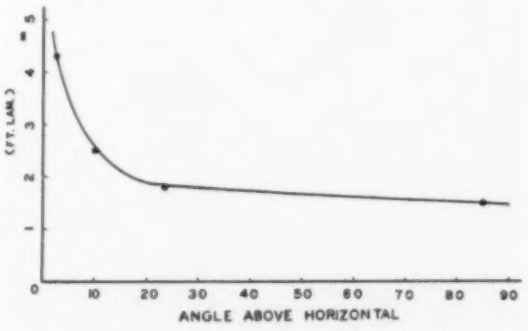

Figure 6. Brightness of a cement runway as a function of viewing angle.

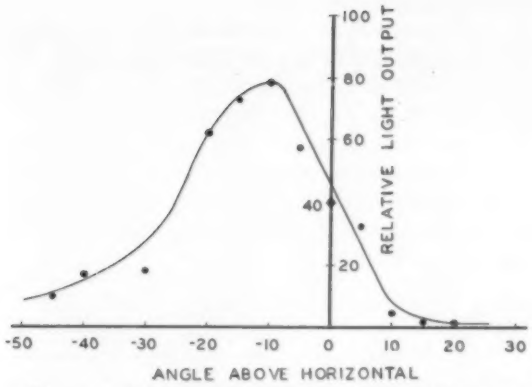

Figure 7. Distribution of the early luminaires at Andrews Field.

on a remote spot on the runway. Thus his viewing angle is low enough so that he is taking advantage of the higher brightness produced by the specular nature of the runway surface. This point is well illustrated in Fig. 8 which is a photograph taken at Andrews Field. The runway brightness at the far end of the illuminated area is clearly higher than in the foreground. Fig. 7 shows the relative vertical distribution of light from the Andrews luminaire. It should be pointed out that an improved fixture has been developed which gives less light above the horizontal (0°) than illustrated in the curve. The angle between the pilot's eye and the fixture on a 150-foot runway is about 12 degrees.

Andrews Field Flight Tests

Since there were several systems proposed for the solution of the "black hole" problem a committee was set up comprising members of the various interested organizations such as, CAA, ALPA, ATA, New York Port Authority, Air Force, Bureau of Aeronautics and others. Robert Gates of the CAA acted as chairman. Andrews Field near Washington, D. C., was set up as a test site and a runway was equipped with ILS, visibility and ceiling testing equipment and a center line system complete with EFAS, (Electronic Flash Approach System). Various types of simulated flush fixtures were installed to provide narrow gauge and other types of runway lighting. Also 715 feet of fluorescent strip lighting was installed beginning at a point 550 feet down the runway from the threshold. Approximately two months of flight testing was carried out by a CAA DC-3 and by several other aircraft. Although extensive good weather testing was done the most significant testing was accomplished in the early morning of April 26, 1957. Official Andrews weather was reported at zero-zero and the test runway instruments reported 50-foot ceiling and visibilities from 400 feet to $\frac{3}{16}$ mile. Mr. Gates, flying the CAA DC-3, reported little glare, good runway texture and good height guidance from the strip lighting during actual touchdowns under these adverse conditions. Captain R. C. Robson flying an American Airlines Convair reported as follows:

> "Andrews weather given as ceiling 50 feet, visibility $\frac{3}{16}$ mile, approach lights No. 3 intensity, narrow gauge No. 3 intensity, fluorescent flood lighting on. Narrow gauge at 200-foot spacing with single middle light between each bar. Pilot maintained glide path needle centered until below 150 feet. Condenser dis-

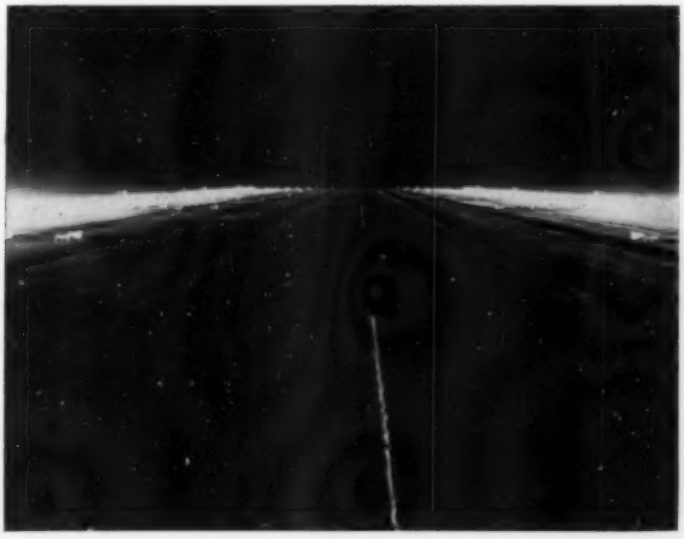

Figure 8. Photo of actual runway as viewed from the approaching aircraft.

charge lights showed small displacement to left at 200 feet altitude; two barettes and 1000-foot bar were the first steady burning lights seen. Directional guidance first given by condenser discharge lights. Threshold seen after 1000-foot bar passed under nose cut-off. Then first narrow gauge bars were visible at slightly under 100 feet altitude. Linear bar effect noticeable with 3-foot spacing of flush lights. Four stub narrow gauge bars could be seen upon crossing threshold which would indicate some 800 feet RVR at approximately 50 feet altitude. Floodlights gave good runway texture, but runway markings not in evidence. There was little halo or blinding effect from floodlighting."

His comments related to runway markings illustrate the need for markings designed for grazing light. The raised tar strip as shown in Fig. 8 showed up well and offers a clue to marking possibilities.

Other Applications

Strip lighting has also been tested for heliport lighting and found to give essential height guidance. Portable fixtures were tested and placed on three sides of a square touchdown area. The open end was always placed toward the approach area and could be changed to meet wind conditions. Good reports were received from Commander Slate of the Salem Coast Guard. It is hoped that similar fixtures will offer a solution to the fog problem on superhighways, and the accurate control should offer good opportunities for floodlighting of buildings and parking lots.

Conclusion

Thus the development of very high fluorescent lamps of relatively small diameters has made possible luminaire designs capable of controlled illumination. These make the use of grazing light with relatively little glare practical for the lighting of long, narrow areas.

I would like to acknowledge the help of Dr. Domina Eberle Spencer in the theory and contour design aspects of the project.

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2. Bossard, R. L.: "Roadway Lighting of Shasta and Grand Coulee Dams," ILLUMINATING ENGINEERING, January 1950.
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Next Year's Conference Papers

Deadline for outlines of next year's conference papers will be December 31, 1957. The earlier date of the conference next year (August 17-22, 1958) has necessitated an earlier deadline for the Papers Committee consideration of proposed papers. Those wishing to present papers before the 1958 conference in Toronto should submit outlines of them, not later than December 31, 1957, to:

Mr. H. F. Davidson, Chairman, Papers Committee
Curtis Lighting of Canada, Ltd.
195 Wicksteed Ave.
Leaside, Toronto 17, Ont.

INSTALLATION IN RESIDENCE OF MR. AND MRS. MATTHEW B. WEINSTEIN, MERION, PA.

Lighting an Enclosed Patio

LIGHTING OBJECTIVE: To provide nighttime illumination in a patio which can be seen from an adjacent dining room through floor-to-ceiling sliding glass doors.

GENERAL INFORMATION: The patio measures approximately 12 feet by 23 feet and has a partial ceiling 9 feet high. Three Wasco (Wasco Products, Inc., Cambridge, Mass.) Plexiglas dome skylights 12 feet 9 inches above the floor provide natural lighting during daylight hours. The lower portion of the sides of the skylight cavity are covered with white textured silk; the next 12 inches above are paneled in bleached mahogany. The floor is varying hues of gray flagstone. The long wall is brown-gray stone. This patio serves, in a sense, as a "mural" for one entire side of the dining room, as well as a source of general lighting needed for the dining room to mellow the effect of its downlighting.

INSTALLATION: Fourteen 30-watt T-8 fluorescent tubes installed in a 6½-inch by 6-inch cove around the inside of the skylight cavity (7 feet by 15½ feet) provide an average of 9 footcandles general lighting at night on a plane 36 inches above the floor. Deluxe cool white lamps were

(over)

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Fig. 2. View of patio from dining room.

chosen for this application to retain the fresh and open daytime appearance and to vitalize the greenery without distorting skin tones. In addition, a Gotham #575 louvered downlight with 75 watt R-30 spot is recessed in the ceiling over the camellia tree to highlight its glossy green foliage, and two Swivelier bullet-shaped units each containing a 150-watt R-40 spot are mounted in the skylight cavity to highlight the potted plants and ivory tusks on the stone wall. With all lights on the average horizontal illumination is about 12 footcandles. Brightnesses are as follows:

White silk immediately above fluorescent lamps (at 45 degrees)	50 ft-L
Stone wall (normal to surface)	5 ft-L
Floor (at 45 degrees)	1 ft-L

Architect: Frederick Wise, Philadelphia. Lighting designed by Elizabeth A. Meehan, Philadelphia Electric Company.

Lighting data submitted by Elizabeth A. Meehan as one solution to a lighting problem and to aid in the design of similar installations.

Published by the Committee on Publications of the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

Uses of New Mercury Lamps

By D. R. PHILLIPS
E. C. MARTT

THE INCREASING number of new mercury lamps for general lighting purposes has resulted in a need for more information on these lamps and their equipment to help guide their use. This paper supplies information on some of the new mercury lamps so that, in each application, the lighting system can give maximum benefit to the user.

JACKETLESS, QUARTZ, HIGH-OUTPUT LIGHT SOURCE

Development Background

A high-output, quartz linear light source with a design life typical of mercury lamps would expand the number of ways of providing lighting for parking lots, work areas, bulletins, building fronts, and other areas of general floodlighting. This source would be advantageous for use in equipment which provides a well-controlled light distribution — particularly in one plane. In addition, it would have advantages for lighting at some of the higher mounting heights in industrial areas.

Recent improvements in the higher output fluorescent lamps provide us with new light sources for many uses in these fields. However, a more compact source of very high light output was needed. Therefore, development work in this direction has been going on for some time. As a result of this work, a 1500-watt tubular, jacketless, quartz mercury lamp (H1500-A23) with a 12-inch lighted length was produced (Fig. 1). This lamp and the background of its development are described below.

The design described here of the 1500-watt quartz lamp for general lighting is a result of many years' work on mercury lamps for photochemical applications. Photochemical lamps are used primarily for production of ultraviolet rather than visible radiation, and these lamps are designed to give reliable service in printing machines and other applications requiring such radiation.

Early photochemical lamps had hard glass envelopes, as do some general lighting lamps. In order to obtain higher wattage loadings, and, therefore, higher efficiency, the arc tubes were changed to quartz.[1] Many sizes of quartz tubular lamps were designed to work satisfactorily under the special conditions found in printing machine applications. Such lamps are produced in sizes ranging from 85 watts to developmental 10,000-watt sizes, and in lighted lengths up to 60 inches. Most of these lamps are highly efficient in producing visible radiation, and therefore, would appear to have many applications in the lighting fields. At the time the present development was started, the only long tubular glass mercury lamp being used for general lighting was the H3000-A9, and there was no quartz lamp of this type. Described below are lamp design problems and features of a jacketless quartz tubular lamp design to fill this need.

Operating Requirements

Several operating conditions have to be met with all-quartz mercury arc lamps. Some of these are: (1) protection of the arc tube from winds or drafts so that the lamp can warm up, (2) protection of the human eye from short-wave ultraviolet radiation, and (3) prevention of oxidation of the lead-in wires at the lamp seal. In the conventional jacketed mercury lamps, these requirements are met by isolating the arc tube from air by enclosing it in a glass envelope. In some applications, however, mercury lamps are used in totally enclosed luminaires, and in these cases, the lamp jacket is often unnecessary. By leaving off the jacket, a more compact, lower-cost lamp can be provided. The 1500-watt lamp was designed for use in applications of this type.

The lamp warm-up, (1), and ultraviolet radia-

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 9-13, 1957, Atlanta, Ga. AUTHORS: Large Lamp Department, General Electric Co., Nela Park, Cleveland, Ohio.

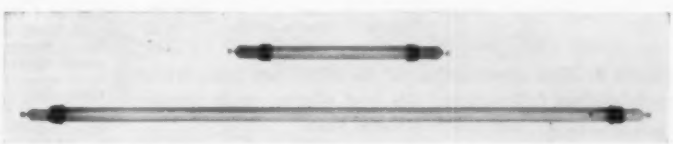


Figure 1. The new all quartz 1500-watt mercury lamp (top) compared to the heat-resistant glass 3000-watt mercury lamp (bottom).

tion, (2) requirements can be met by a properly designed reflector and glass cover to enclose the lamp. However, to prevent oxidation of the seals, (3), for this highly loaded lamp, a new design of lamp base and seal was necessary.

Since the temperature of the quartz bulb during lamp operation is about 1500 F, a great deal of heat has to be taken away from the lamp seals. It is well known that the temperatures at the end of the molybdenum foil seal (measured at the tab) must be less than 650 F and preferably in the region of 550 F and 600 F (Fig. 2).

Lamp Design

A special lamp end construction was designed to meet these temperature conditions. It combines a heat-conducting lead and a special, ventilated insulator with a standard spade terminal. Air currents which are generated inside an enclosed luminaire flow up through the slotted base and past the lamp seal, helping to cool it. Nickel-plated copper leads of large cross section between the seal tab and the spade are used to provide an excellent path for heat to flow to the relatively cool spade contact. The spade terminal and the lamp sockets are cooled by conduction to the circuit lead wires and to the fixture housing. The spade terminal is silver plated, and the socket contacts are nickel plated to prevent oxidation.

A further change was to move the lamp electrodes as far from the lamp seals as warm-up requirements would permit. This greatly reduced the amount of heat (and light) dissipated within the base and therefore reduced the amount of heat to be carried away by the seal. The combined changes described above reduced the seal temperature to a safe value of about 570 F in a totally enclosed, 4.5 cubic foot housing (Fig. 3). This temperature will vary somewhat depending upon reflector design and operating conditions.

Since quartz glass has to be kept free of finger marks to prevent devitrification when operated at high temperatures, a paper sleeve is left on the quartz tube until it is installed. Whenever the lamp is handled without the sleeve, it should be held by the lamp base. The lamp must always be operated in a suitable enclosure.

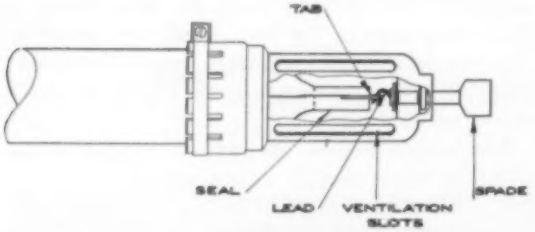


Figure 2. End construction of the 1500-watt lamp with molybdenum foil seal and tab, lead wire to spade terminal and ventilated base.

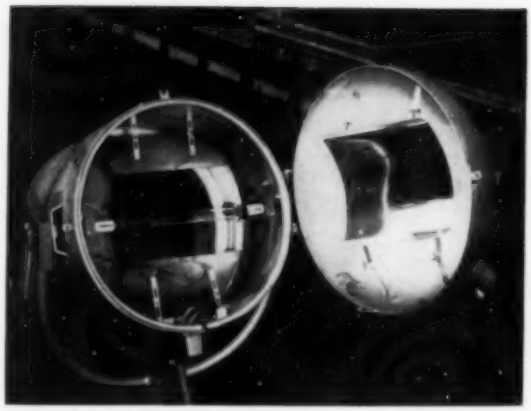


Figure 3. Prototype of floodlight used to light the parking lot area of New York International Airport at Idlewild, New York. The back of the reflector swings open for maintenance.

Lamp Data

Table I provides data on this lamp. For comparison purposes, data for the older 3000-watt tubular mercury lamp (H3000-A9) are also shown. The new lamp has 23 per cent higher efficiency and almost double the watts per inch of the 3000-watt lamp. As a result, it produces about 2½ times as much light per foot.

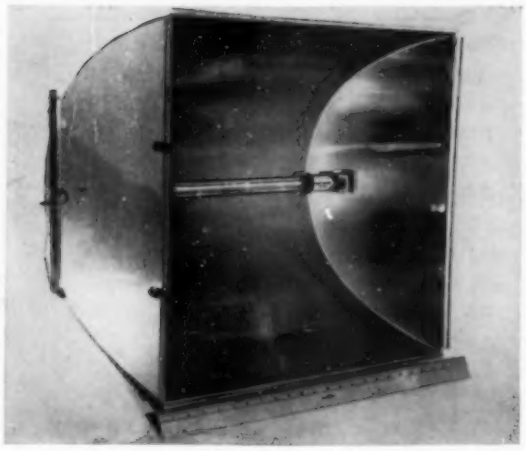
Luminaire Designs

To take advantage of the efficiency and compactness of these lamps, proper luminaire designs are

TABLE I — Physical and Electrical Characteristics of H1500-A23 and H3000-A9 Mercury Lamps.

	H1500-A23	H3000-A9
Watts	1,500	3,000
Lumens (Approx. Initial)	81,000	132,000
Lumens Per Watt	54	44
Mean Lumens (Approx.)	62,000[1]	103,000
Lumens Per Foot	81,000	33,000
Rated Life, Hours	6,000[1]	6,000
Bulb, Glass Type	T9 (Quartz)	T-9½ (Glass)
Base	S.C. Terminal	S.C. Terminal
Burning Position	Horizontal	Any
Maximum Over-all Length, Inches	19½	55
Loading, Watts Per Inch	125	63
Arc Length, Inches	12	48
Lamp Operating Volts	425	535
Minimum Open Circuit Voltage	750 (to −10° F)	850[3]
at Minimum Primary Voltage	900 (to −20° F)	
Lamp Starting Current, Amps.	6[2]	9.3
Lamp Operating Current, Amps.	3.9	6.1

[1]Estimated.
[2]7.0 Amps. Max.
[3]Nominal Open Circuit Voltage at Rated Primary Voltage.



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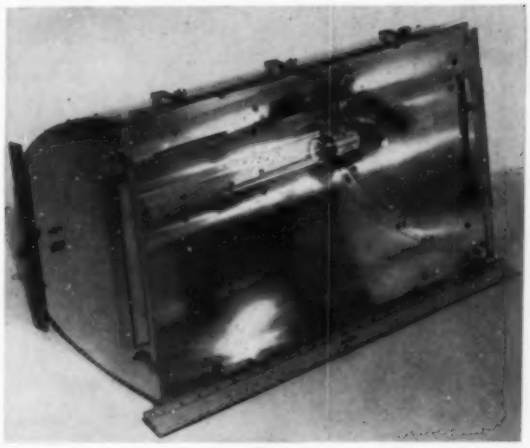

B

C

D

Figure 4. Experimental industrial luminaires. A — glass bottom (not shown), no ventilation. B — glass bottom (not shown), ventilated. C — glass jacket over lamp (not shown), open top reflector. D — experimental floodlighting reflector with three longitudinal louvers for lamp shielding.

necessary. As already mentioned, these designs will have to (1) allow the lamp to warm up, (2) eliminate ultraviolet radiation, and (3) allow the lamp seals to operate at temperatures below 650F under all conditions. To investigate designs for various applications, four experimental units were made, three for industrial lighting and one for floodlighting (Fig. 4). For the experimental reflectors, specular aluminum was used to determine some of the light control possibilities. However, in most industrial applications, the aluminum would probably be etched to obtain a smoother light distribution.

1. Industrial Luminaires

In the industrial reflectors (Figs. A, B and C) three methods were employed to meet the requirements mentioned above. Reflector A (20 inches wide, 22 inches long, 15 inches deep) was designed to enclose the lamp. Reflector B (12 inches wide, 22 inches long, 11 inches deep) enclosed the lamp but provided ventilation as shown in Fig. 5. Both reflectors A and B had cover glasses. Considerations of seal temperatures and luminaire efficiency governed the selection of luminaire size. There appears to be a limit as to the minimum luminaire size which will meet the seal temperature requirements — even in ventilated units of type B.

For small luminaires of this type it may be possible to enclose the arc tube in a glass jacket (as part of the fixture) and leave the lamp bases exposed. As an exploratory procedure, reflector C (9 inches wide, 18 inches long, 8 inches deep) was made, using a supplementary 2-inch diameter hard

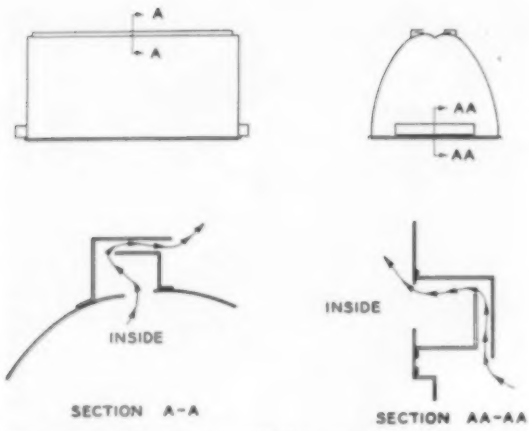

Figure 5. Method of ventilation employed for experimental industrial luminaire B (Fig. 4B). Air is allowed to flow past the lamp bases, but direct radiation from the lamp is eliminated.

glass tube over the quartz lamp. This procedure of jacketing the lamp, however, is not recommended at the present time, since a small glass enclosure causes the arc tube temperature to increase. It would be necessary to run life tests under these conditions to find the effect on lumen maintenance and lamp life. The crosswise shielding angle of the lamp was 45 degrees for each reflector. Table II summarizes the data on these units.

Similar downward light distributions were obtained from each of the three industrial luminaires. The candlepower curve for reflector B is shown in Fig. 6. Notice that very high candlepower was obtained at an angle of approximately 38 degrees from nadir. This reflector was then etched slightly resulting in a smoother distribution of light. Adequate light is provided for vertical illumination with low fixture brightness at the higher angles (Fig. 6). The candlepower curve could be "smoothed" even more by a heavier etching of the aluminum.

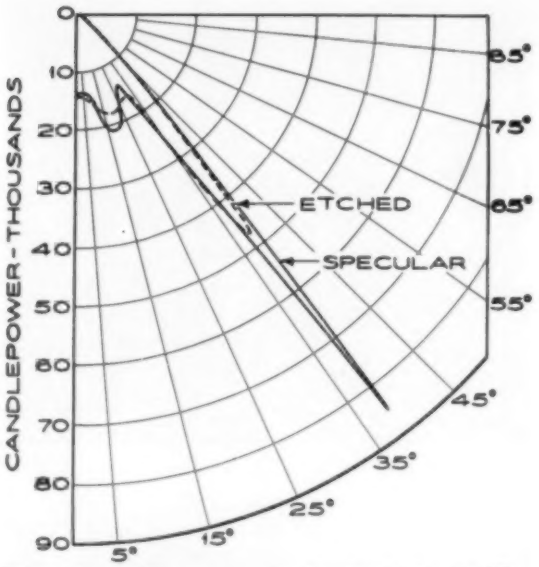

Figure 6. Candlepower curves for luminaire B (Fig. 4B) — specular and etched aluminum reflector. Plane of measurement —perpendicular to lamp axis.

It will be noticed in Table II that the luminaire efficiencies are similar to those of reflectors designed for other mercury lamp types. The efficiency of reflector B (etched aluminum) would probably have been higher if the aluminum had been processed after it was etched.

Lamp seal temperatures (measured at the seal tab) were below the 650F limit with all reflectors. However, if the ambient temperatures had been higher than 80F, the lamp seal temperatures in reflector A would have been near or above the limit. Therefore, an entirely closed unit of this type should have a volume greater than 2.8 cubic feet. The factor determining luminaire volume may be the temperature limitations of the housing rather than the lamp seal.

TABLE II — Data on Experimental Industrial Luminaires for H1500-A23 Quartz Tubular Lamp.

	Crosswise Shielding	Luminaire Efficiency	Reflector Design	Lamp Seal Temperatures (Ambient—80° F)
Luminaire A	45°	80%	20" W. x 22" L. x 15" D. Volume — 2.8 Cu. Ft. Glass Cover No Ventilation	617° F
Luminaire B (specular aluminum reflector — 82% reflectance)	45°	78%	12" W. x 22" L. x 11" D. Volume — 1.4 Cu. Ft. Glass Cover Ventilated	510° F
Luminaire B (etched aluminum reflector — 76% reflectance)	45°	68%		510° F
Luminaire C	45°	89%	9" W. x 18" L. x 8" D. 2" Glass Jacket over lamp 2"Reflector Opening above lamp	less than 500° F

2. Floodlighting Luminaires

The experimental floodlighting reflector, Fig. 4D, was designed for building floodlighting applications where the units need to be mounted close to the building. The requirements are two-fold: (A) In the plane perpendicular to the lamp axis, a narrow, high-intensity beam of light is needed to provide sufficient light on the facade of a tall building. (B) In the plane parallel to the lamp axis, a controlled distribution is necessary to provide a uniform brightness pattern across the building front. A parabolic reflector contour was used to fulfill requirement A. The ends of the reflector were angled outward to help meet condition B. Baffles were also provided on one side of the reflector to shield the lamp.

Although the reflector was experimental and thus subject to more variations than a production model, its beam spread was only 20 degrees in the plane perpendicular to the lamp axis and it had an average intensity over the central 3-degree cone of 140,000 candlepower. In the plane parallel to the lamp axis, the desired "batwing" distribution provided a maximum of 180,000 candlepower at about 30° from nadir.

The effectiveness of this unit was obvious when it alone was used to light a 30-foot by 250-foot section of a building. It was mounted about 12 feet from the facade.

Other reflector designs would make this lamp useful for general floodlighting such as parking lots and outdoor work areas. An outstanding example of this type of application is at the New York International Airport. Several hundred 1500-watt mercury lamps are employed to floodlight parking and landscaped areas. A close-up of the prototype luminaire designed for this application is shown in Fig. 3. Each unit houses one lamp and a glass cover seals the unit. The aluminum reflector is made up of five different sections. The units are mounted at 75 feet on standards placed on a spacing of about 320 feet. While the number of units per standard vary, they are aimed to provide an average lighting level of approximately three footcandles.

Blacklight Applications

Not only is the 1500-watt lamp an efficient generator of visible light, it also produces a great deal of ultraviolet radiation in the blacklight region (Table III). Thus, it will be useful in the fields of spectacular and electrical advertising and for inspection and supplementary lighting in industry.

TABLE III — Radiant Energy from Lamps* — Total Watts in Indicated Bands.

Wavelength Band Angstroms	H1500-A23	H3000-A9
Far Ultraviolet 2200 - 2800	189	0
Middle Ultraviolet 2800 - 3200	157	0.10
Near Ultraviolet 3200 - 3800	140	45
Visible 3800 - 7600	227	353

*The type of luminaire cover glass will determine the actual radiation from the luminaire.

Color-Improved Reflector Light Sources

Although a tubular, high-output mercury lamp has advantages in some areas of industrial and exterior lighting, in others the color-improved reflector mercury lamps are often the more logical choice. While they were mentioned in a previous paper[2] in Illuminating Engineering, recent additions to this line of lamps increase the need for more information to guide their application.

In the industrial lighting field a light source has always been desired which would reduce maintenance, provide color improved light, and result in lower cost of light. Several lamps have now been developed which fulfill most of these requirements. They are the 400-watt (H400-RC1 and H400-RW1) and 1000-watt (H1000-RC15 and H1000-RC12) color-improved reflector mercury lamps (Fig. 7). All these lamps have some degree of color improvement, and they have controlled distributions which contribute toward reduced maintenance and cost of light.

Design Features of 400-Watt Reflector Lamps

A lamp with good maintenance characteristics was already available—the 400-watt reflector lamp (H400-R1). However, this lamp produced totally direct light without color improvement. The application of a red-light-producing phosphor[3,4] over the silver reflecting surface improved color rendition, but reduced light output. By going one step further and substituting the phosphor for the silver reflector and changing the frost density of the bulb, a satisfactory 400-watt lamp was produced — the H400-RC1. This change resulted in a 54 per cent increase in light output with no decrease in the amount of light in the downward direction (base up operation). Recently, a white phosphor has been used to obtain even more light but with some sacrifice in color rendition of reds. This lamp is the 400-watt white reflector mercury lamp (H400-

RW1). The relative red output of this and other lamps is compared in Table IV, column 8.

Design Features of 1000-Watt Reflector Lamps

The R52 bulb could not be used to enclose the 1000-watt mercury arc tube because of temperature and space restrictions. While a much larger bulb of similar shape could be designed, cost-of-light estimates indicate that lighting systems using such lamps would not be as economical as those employing regular mercury lamps. For this reason, modifications of the regular 1000-watt, color-improved lamp (H1000-C15) were investigated. As a result, it was found that by phosphor coating only the top half of the lamp jacket (base up operation), it was possible to obtain satisfactory lamp characteristics at no increase in cost. While the shielding of the arc tube by the lamp phosphor is less than with reflector-shaped bulbs, this lamp (H1000-RC15) has a light distribution similar to that of the 400-watt lamp, the H400-RC1. It directs two-thirds of its light downward (when mounted base up). In Table IV are the photometric data on the various lamps. The low-voltage version, the H1000-RC12, has a similar distribution.

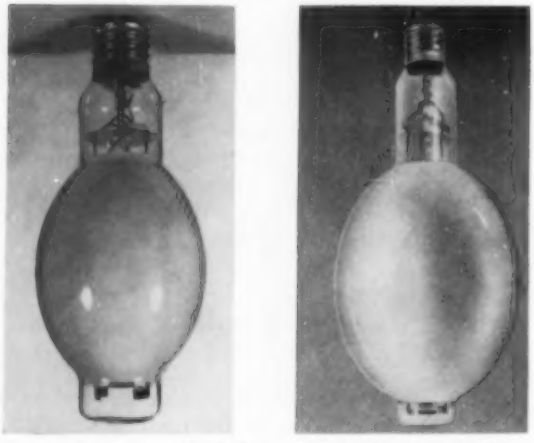

Figure 7A. Left, H400-J1, regular 400-watt, and right, H1000-C15 or -C12 1000-watt color-improved mercury lamps.

Reflector Lamps Combined With External Reflectors

It can be seen that the color-improved reflector lamps produce substantially more light in the 0-60-degree zone than other regular mercury lamps. Thus, the amount of light controlled by the external reflector is less than that of conventional mercury lamps. This provides an opportunity to design more efficient reflectors and reflectors which have better lighting maintenance characteristics.

To investigate the effect of lamp type on luminaire efficiency various 400-watt mercury lamps were tested in the same deep-bowl porcelain enamel reflector. The results are shown in column 7 of Table IV. It will be noticed that the luminaire efficiency with the color-improved reflector lamp (H400-RC1) is approximately 9 per cent higher than with the regular mercury (H400-E1) and color improved (H400-J1) lamps. Fixture lumens are 17,400 (-RC1), 16,400 (-E1), and 15,400 (-J1).

Since this comparison does not take into account differences in reflector finish and contour, the added initial light on the work surface may not be proportional to these figures. However, it is obvious that if individual luminaires are designed for each lamp, those designed for the reflector-type lamps will generally provide the greatest amount of useful light. In addition, the better maintenance of these lamps results in higher maintained luminaire light output. The actual amount will depend upon the dirt conditions of the industrial area.

Improved visual comfort is another benefit which can be obtained in areas where these lamps are

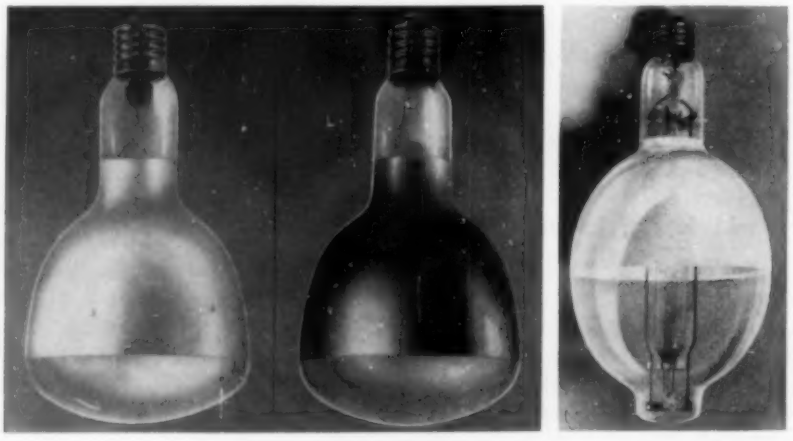

Figure 7B. Reflector type lamps. Left, H400-RC1 or -RW1; center, H400-R1, and right, H1000-RC15 or -RC12.

TABLE IV — Photometric Data Comparing Color-Improved Reflector Mercury Lamps with Regular Mercury Lamps.

1 Lamp	2 Initial Lumens	3 Mean Lumens	4 Upward Lumens (Base-Up Operation)	5 Downward Lumens (Base-Up Operation)	6 Lumens in 0° - 60° Zone	7 Luminaire Lumens** (Luminaire Efficiency)	8 Per Cent Red Light***
H400-E1	21,000	16,400 (78)*	10,400 (50)*	10,600 (50)*	4,560 (22)*	16,400 (78)*	1.2
H400-J1	20,000	15,600 (78)	8,800 (44)	11,200 (56)	5,280 (26)	15,400 (77)	8.0
H400-RW1	22,000		7,600 (34)	14,400 (66)	9,140 (42)	18,700 (85)	3.0
H400-RC1	20,500	17,000 (83)	7,100 (34)	13,400 (66)	8,510 (42)	17,400 (85)	7.0
H1000-A15 and -A12	54,000	40,500 (75)	27,100 (50)	26,900 (50)	11,500 (21)		1.2
H1000-RC15 and -RC-12	53,000	38,000 (72)	17,400 (33)	35,600 (67)	19,950 (38)		4.0
H1000-C15 and -C12	51,500	36,100 (70)	22,400 (44)	29,100 (56)	14,200 (28)		7.5

*Per cent of initial lamp lumens shown in parenthesis.
**Deep bowl porcelain enamel reflector.
***Measured through a Wratten #25 filter.

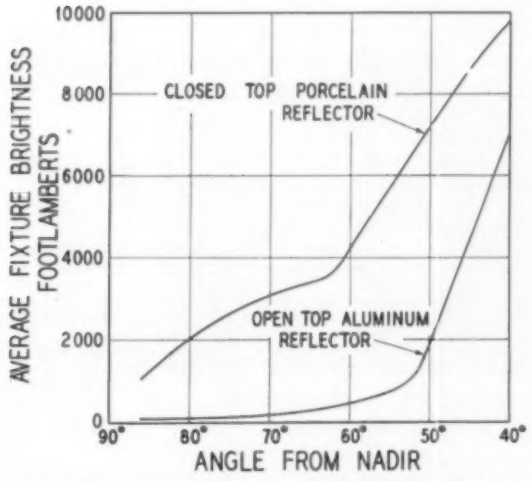

Figure 8. Average fixture brightness vs. angle from nadir for a typical closed top porcelain enamel reflector and an open top aluminum reflector — both housing an H400-RC1 mercury lamp.

installed in well-shielded, upward-light luminaires. The brightness of aluminum reflectors of this type is substantially reduced over conventional enamelled reflectors. Fig. 8 compares the average brightness of these two types of units housing H400-RC1 lamps. Notice that in all the critical comfort angles between 50 and 80 degrees from nadir the average brightness of the enamelled unit is always more than three times that of the aluminum open top unit. An earlier paper[2] discussed comfort of lighting systems employing upward-light aluminum reflectors for mercury lamps.

Installations of Reflector Lamps

Since the previous paper was written, there have been several industrial installations employing upward-light luminaires. The resulting visual comfort has been outstanding; for example, compare the similar areas illustrated in Figs. 9 and 10. The

Figure 9. Continuous rows of upward light fluorescent fixtures mounted at 22 feet provide an average level of 30 footcandles.

Figure 10. Visual comfort of this mercury lighting system rivals that of the fluorescent lighted area shown in Fig. 9. H400-RC1 lamps in upward light aluminum reflectors are mounted at 28 feet. Lighting level is approximately 35 footcandles.

fluorescent system installed at a 22-foot mounting height provides an average lighting level of approximately 30 footcandles. Fig. 10 shows an installation of the 400-watt color-improved reflector lamps (H400-RC1) in upward light fixtures at a mounting height of 28 feet. The lighting level is approximately 35 footcandles. This comparison indicates that in areas where reflected glare is not a problem, the visual comfort of mercury lighting can rival that of fluorescent.

Another guiding factor is economics. Studies reveal that lowest cost of light for 400-watt mercury installations will generally be obtained with the 400-watt white reflector lamp (H400-RW1). However, as is pointed out in Table IV, column 8, the amount of red light this lamp produces is less than that of the 400-watt color-improved lamp (H400-RC1). Where 1000-watt mercury lamps are considered, the use of the reflector color-improved lamps (H1000-RC15 and RC12) usually results in equal or lower cost of light than any other 1000-watt mercury lamp system.

Summary

Several new mercury light sources enable designers to more adequately solve many problems of lighting interior and exterior areas. A new 1500-watt, tubular all-quartz mercury lamp provides a compact high output source which is well suited to many exterior floodlighting applications. Its high efficiency and relatively small size also make it advantageous for use at the higher mounting heights in industrial areas.

The reflector color-improved mercury lamps enable fixture manufacturers to design reflectors which provide higher efficiency and better maintenance. Thus, the lighting user has a way to reduce maintenance and lighting costs, to improve color rendition, and to obtain economically a lighting system with improved visual comfort.

Acknowledgments

The authors wish to thank Messrs. D. E. Beeninga and L. J. Smialek for their part in the development of the 1500-watt mercury lamp, and Mr. J. P. Frier for his assistance in obtaining much of the luminaire data for this lamp. In addition, we are indebted to Mr. C. M. Cutler for his consultation — particularly concerning the application of the 1500-watt lamp.

The prototype luminaire in Fig. 3 was made by General Electric Outdoor Lighting Department for the Port of New York Authority.

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Watch for November I.E.

The November issue of ILLUMINATING ENGINEERING will feature the winners on the national level of the My Most Interesting Lighting Job Contest — both Commercial and Residential Sections.

INSTALLATION AT FARMERS AND MECHANICS BANK,
MAIN AND CHURCH STS., PHOENIXVILLE, PA.

Lighting a Bank

LIGHTING OBJECTIVE: To provide general illumination for banking operations from a lighting system incorporated into the ceiling design.

GENERAL INFORMATION: The banking area shown above is approximately 37 feet by 56 feet with a ceiling height of 35 feet. The large center skylight measures 17 feet by 30 feet. Colors and reflectances of the major surfaces are as follows:

ceiling	ivory-white	73% RF
skylight plastic	white	55% RF
cornice and trim	light buff	45% RF
walls		
upper portion	pale blue	71% RF
middle portion	sand	51% RF
lower portion	tan marble	52% RF
curtains	light tan	42% RF
service counter front	tan marble	52% RF
woodwork	walnut	11% RF
vault door	steel	76% RF
floor	tan terrazzo	25% RF

INSTALLATION: An average general illumination level of 45 to 50 footcandles is provided by the following means:

(over)

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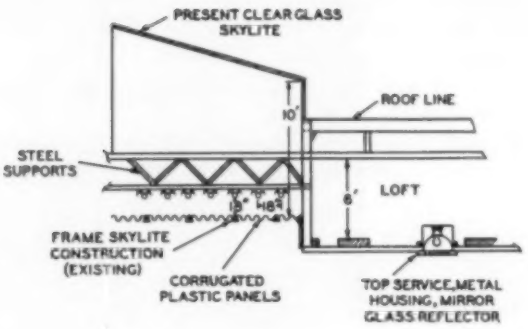

Figure 2 (right). Partial section through ceiling.

1. By installing nineteen fluorescent luminaires (Benjamin catalog No. NHS-2-196 with symmetrical top reflectors) each 16 feet long and equipped with two 96-inch T-12 standard cool white slimline lamps, on the underside of steel supports in an existing skylight, as shown in Fig. 2. The nineteen 16-foot units are spaced 18 inches apart 18 inches above Benjamin "'Panel-Glo" corrugated vinyl panels, catalog No. N-40650. These 3- by 3-foot panels were cut to proper size and are inserted in existing frame construction which eliminated the cost of component parts for support and suspension. All wood and steel surfaces in the skylight plenum are painted flat white. The upper clear glass skylight has been left unpainted so that daylight can be utilized when available.

2. By fourteen recessed incandescent luminaires, Pittsburgh catalog No. I-505-8 (UL), installed on approximately 10-foot center about the periphery of the skylight. Each unit is equipped with a symmetric mirror glass reflector, a hinged concentric ring louver and a 500-watt PS-40 clear lamp.

All of the above luminaires are relamped and maintained from the 6-foot high loft. The recessed incandescent units are serviced from the top. The fluorescent units, which contain spring loaded sockets, are relamped without going out over the plastic.

The ornate chandelier has been retained to preserve the original architectural appearance of the area. However, 40-watt G-25 outside coated ivory lamps have been installed to give a pleasing decorative glow to the chandelier.

Room surface brightnesses are as follows:

skylight at 45°	115 ft-L	walls	
recessed incandescent		upper portion	11 ft-L
units at 45°	390 ft-L	middle portion	7 ft-L
chandelier at 45°	380 ft-L	lower portion	7 ft-L
ceiling	8 ft-L	curtains	6 ft-L
cornice and trim	8 ft-L	service counter front	7 ft-L
		woodwork	2 ft-L
		vault door	12 ft-L
		floor	8 ft-L

Lighting designed by George C. Linthicum, Lighting Engineer, Philadelphia Electric Co., Philadelphia, Pa.; Electrical Contractor: A. J. Hasson, Mont Clare, Pa.

Lighting data submitted by George C. Linthicum and George T. Anderson, Jr., Lighting Engineers, Philadelphia Electric Co., Philadelphia, Pa., as an illustration of good lighting practice and to aid in the design of similar installations.

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Experience with High Level Office Lighting

By J. M. KETCH and W. S. FISHER

THERE IS a wide gap between the levels of illumination which laboratory tests indicate as desirable for office tasks and those which are currently being installed. Although there is a gradual increase in accepted footcandle levels, it is a footcandle-by-footcandle approach toward those higher levels rather than a full scale movement. Yet when reading, we naturally take advantage of those higher levels at windows, under skylights, and in the shade of a porch.

It is obvious that installation and operating costs influence the choice of footcandle levels of illumination. Aside from economics, however, there are equally important questions as to whether we know how to design high levels that are visually comfortable, whether we have suitable luminaires and application techniques to produce them, and whether the brightnesses and brightness relationships recommended for 50-100-footcandle installations apply also to those in the 100-500-footcandle range.

Believing that the answers to many of these questions can be found only by living and working full time under full scale office installations with high levels of illumination the authors, and an associate, Carl Allen, have enjoyed a year or more under two types of high level installations. Their experiences and recommendations for other such tests or installations are reported here for the benefit of others.

First Installation — Room 14 feet by 18 feet, ceiling 11 feet 10 inches; windows two sides, north and east; single occupancy. The aim was for a level of about 200 footcandles. The technique used was a large centrally located free-floating panel louver using a new type of expanded hexagonal-cell aluminum louvers. These were suspended by a T-bar system 18 inches from the ceiling.

The light sources were thirty-two 96T12 cool white fluorescent lamps mounted on 2-lamp channels on the ceiling and spaced closer at the center of the room than at the perimeter.

Instead of a wall-to-wall louverall system, the 12-foot by 16-foot floating panel made up of 2-foot by 4-foot elements, hangs free of all walls by one foot. In comparison with the wall-to-wall technique, the floating panel system (1) avoids fitting panels around pipes, pilasters, etc.; (2) maintains a feeling of room height; and (3) places some light on the upper side walls. The air conditioning inlet was below the panel level, but if it had been above, and if the panels had been diffusing sheets, the

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 9-13, 1957, Atlanta, Ga. AUTHORS: General Electric Co., Nela Park, Cleveland, Ohio.

Figure 1. This "Floating Panel Luminaire" was installed without the need for fitting to the room's perimeter. Illumination on the table top is well over 200 footcandles.

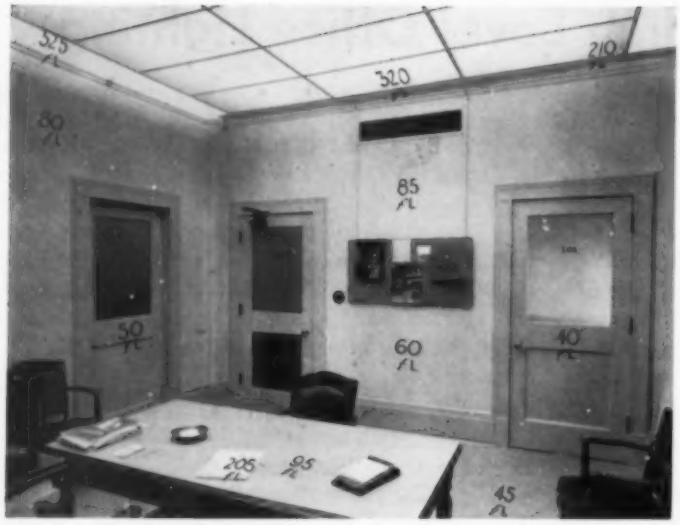

Figure 2. Brightness survey of room with the "Floating Panel Luminaire." The louvers are ¼-inch hexagonal aluminum providing 52½° shielding.

open space at the perimeter would provide plenty of area for air circulation.

Several types of hexagonal cell panels were experimented with: ¼-inch cell, 45° and 60° shielding, both aluminum and white finish; and ⅜-inch cell, 45° shielding, aluminum finish. Recently, ¼-inch cell, 52½° shielding, aluminum finish panels were installed. For the original installation, the ¼-inch, 45° aluminum panel seemed to provide the most pleasing cell size, and panel brightness in relation to the upper walls. Both the white and aluminum finish 60° shielding cells, and the 45° cells with white sprayed finish were too low in brightness, and created a heavy appearance in relation to the brighter side walls. For installation of higher footcandle levels, however, these characteristics could be of distinct advantage.

To balance the brightness pattern in the office, the following reflectances were adopted for the major surfaces: walls, gray (55 per cent) and green (60 per cent); wood trim, warm gray (45 per cent); carpet, gray (30 per cent); desk top, tan (35 per cent).

Because the office is for single occupancy, the lamps were spaced for central emphasis rather than uniformity. Using thirty-two 96T12 cool white lamps above a floating ¼-inch, 45° aluminum cell panel, the system produced initially 250-260 footcandles on the central table and about 220 average.

The occupant has found the room visually and physically comfortable, and pleasant. The illumination has proved to be well suited for all normal visual office tasks. For two specific job types — work on very glossy surfaces, and for long-time work on large areas of white prints — the reflections or brightnesses may be annoying. Although the occupant felt that the 45° shielding louvers were comfortable, several people with shallow eye sockets felt that they would prefer a deeper shielding. Recently, the panels were changed to those with 52½° shielding. They are just noticeably lower in brightness than those of 45° shielding and, of course, the lamps are more deeply shielded.

The two cases where the system may become uncomfortable are (1) working on glossy photographs and glass slides laid flat (this is typical, of course, of all open direct and louvered systems), and (2) working for long periods on large areas of white prints. The second involves the combination of time, large work area, and its position in the field of view. This latter combination, and the one of large vertical low brightness areas such as walls, need additional field experiences and laboratory checks before conclusions can be made.

Second Installation — Room 14 feet by 18 feet; ceiling 10 feet 3 inches; windows two sides, north and west; double occupancy. The aim was to provide at least 400 footcandles on the desk surfaces. The technique employed was a "trofferall" system consisting of 12-inch wide two-lamp etched aluminum troffers installed side-by-side. The luminaires have individual parabolic reflectors for each lamp. The shielding is 40° crosswise and 35° lengthwise.

Forty-watt rapid start lamps were employed operated on thyratron dimming controls to permit any lighting level between blackout and full intensity to be obtained. The dimming feature was included partly because it was desired to study various visual tasks under different levels of illumination and partly because of uncertainty during the

Figure 3. Much evidence points toward Nature's "shade-of-a-tree" illumination levels as the optimum for many office-type visual tasks. The light meter on the left desk reads about 450 footcandles under the prevailing conditions.

planning as to whether the full amount of lighting would be acceptable. It is interesting to note that the occupants always use the full level for their day-to-day work. The dimming feature is used only for demonstration and experimental work.

Choice of the parabolic aluminum troffer was influenced by previous good experience with single lamp deep aluminum troffer installations that provided 50 to 75 footcandles. For crosswise viewing this luminaire has a brightness at typical angles about that of white paper lighted to 75 footcandles. The two-lamp troffer design was dictated for this installation in order to obtain the desired lighting level, and for the crosswise orientation, visual tasks on white paper become the brightest surface in the room — even brighter than the luminaires (Fig. 5).

Present laboratory data do not include information on direct glare and the brightness preferences of people at lighting levels of several hundreds of footcandles. However, it is possible to make estimates from presently known data and these indicate a Visual Comfort Index (VCI) of approximately 85 per cent for the crossview of the troffers (usual viewing direction) and 50 per cent for the lengthwise view. This order of crosswise brightness control has been altogether acceptable to the occupants who have experienced no discomfort for that viewing direction. At the same time it should be pointed out that lengthwise brightness control for

Figure 4. In this office the illumination on the desks is the same as that in Fig. 3, 450 footcandles. All the components of the environment were carefully chosen before the lighting was installed.

Figure 5. A brightness survey of the aluminum "trofferall" installation reveals the seeing task on white paper to be the brightest surface in the room for the viewing direction illustrated.

these units, while satisfactory for many 50- or 100-footcandle installations, leaves something to be desired at the higher levels.

The ¼-inch cell hexagonal aluminum louver providing 45° shielding which was employed in the first office was also observed in the second office attached to the bottom of several troffers. This markedly improved the brightness of the unit lengthwise, but it impaired the good control characteristics of the parabolic reflector crosswise.

Several new louver designs have been investigated which look promising for improving the lengthwise control without increasing the cross brightness. One such design for a fixture employing high light output lamps has been reported.[1] Application of the new louver to this office should bring the VCI values for crosswise and lengthwise view more nearly into balance and minimize the differences which now are seen as one turns his direction of view by 90°.

All the components of the environment were carefully selected so as not to create eye-jarring brightness differences among room and work surfaces. The room was newly furnished and carpeted, so there was an opportunity to select from the standard offerings of manufacturers colors of equipment having reflectances that would blend into a well-balanced brightness pattern.

Colors and reflectances of major surfaces are: walls, gray (55 per cent) and aqua (50 per cent); wood trim, warm gray (45 per cent); venetian blinds, ivory (60 per cent); carpeting, speckled beige and brown (25 per cent); desk top, gray laminated plastic (38 per cent); desk bases, warm gray (45 per cent). The desk bases have a higher reflectance than desk tops. This was done to more nearly balance the brightness of vertical and horizontal surfaces. Beige-colored telephones were also installed.

When the room is in use the venetian blinds are closed on the west exposure which is to the rear of the occupants. The north side of the building is at the crest of a hill where the ground drops off very quickly. There are no shade trees on this side to give protection from sky brightness. Hence, the blinds are generally raised only 18 inches to 24 inches to permit some view of the outside. Full or even half-raised blinds expose a large area of north sky to view which is objectionally bright on all except heavily overcast days.

The north windows were glazed for a trial period with low transmission heat-absorbing glass. This material transmitted only 10 per cent to 12 per cent of the visible light. One purpose of the low-transmission glass is to bring about a better balance in brightness between daylighted objects out-of-doors and interior electrically-lighted room surfaces. The material appears to accomplish this objective in 30- to 50-footcandle installations without one's being particularly aware of the low transmission. However, where several hundred footcandles are supplied in the interior, the outside appearance grows relatively darker and reflections of the room in the glass become noticeable, much as they are at night.

The lamps used in both offices are cool white. These have been quite satisfactory, combining high efficiency with reasonable color rendition. The atmosphere provided by cool white lamps is most compatible with the natural daylight to which there

is a generous exposure. There has been no indication that a cooler color quality light source would be more desirable.

The authors have also experienced lighting levels in some other installations as high as 200 footcandles where warm white and deluxe warm white fluorescent lamps were used. At this level the warm color is quite intense and suggests psychologically that the temperature in the room is uncomfortably warm. On the other hand it is generally accepted that the warm fluorescent colors are preferred at low lighting levels.

Reflected glare has not proved to be a significant factor in this office. Glossy finishes in office equipment or materials are seldom functional and if shiny surfaces do not occur there is no reflected glare problem. With glossy photographs for example, trouble is likely to be encountered in any lighting situation. The reflections in such prints appear to be no more objectionable than most installations as lamps are on 6-inch centers and the reflectors behind the lamps are filled out with the lamp image to some extent. In this way, the lighting begins to approach a luminous ceiling. The solution to avoiding the reflections when they occur is the same as in most installations — to shift the angle at which the photograph is held until it reflects a surface less bright than the ceiling, such as a wall or the individual holding the print.

As a matter of general interest we have asked a number of visitors to this office to sit at a desk, look at any of several visual tasks, and adjust the dimming control knob to a level they would "like" to have. This is not a reliable criterion of what is "right" or "desirable" for any seeing job, but it is of interest to note that a great many select levels between 200 and 300 footcandles. A few have felt they'd like more than the maximum provided. No one has ever selected less than 100 footcandles. The authors expect to accumulate more data on such "preference" tests.

A great variety of visual tasks are performed at the desks in these offices. For all of them the full lighting level is preferred by the occupants. The tasks are viewed against gray desk tops having about 38 per cent reflectance.

As in the case of the first office a condition of discomfort has been experienced when working for long periods of time on large white prints which cover the entire desk top. Under this condition of concentration on fine detail there is an increasing tendency to bring the eyes closer and closer to the task until the white print fills almost the entire visual field. Again it is a matter of total quantity of light to the eye which causes the discomfort. Reminding oneself to raise the head and look about intermittently and not to bring the eyes so close to the paper except when necessary has mitigated this condition.

Pursuing the matter of large, bright areas further, one of the desks has been temporarily covered for several months with a material having 26 per cent reflectance. This is at the low end of the acceptable 26 per cent to 44 per cent reflectance range for furniture as specified by the "Recommended Practice for Office Lighting." This would not solve the problem of a white print's covering the whole desk top, but the thought was to provide a lower overall brightness for task and background when the task is small, say, 8½ inches by 11 inches. To date no positive conclusions have been drawn. The 26 per cent reflectance background is acceptable and not so dark as to create an uncomfortable brightness difference with the tasks. On the other hand, it does not appear to be preferable to the 38 per cent reflectance surface.

Considerations of heat and its effects naturally arise as these installations are contemplated. The first office discussed has a lamp and ballast load averaging about 11 watts per square foot. No changes were necessary in the air conditioning system after this was installed and the total heat was just perceptibly more noticeable than it was with the previous lighting system which averaged approximately six watts per square foot.

In the second office the load averages twenty-one watts per square foot. (If it had been installed in a conventional manner without the dimming feature, the load would have been 17.2 watts per square foot.)

Radiant heat is not noticeable immediately after turning on the lighting. After three to four hours of operation, the lamps, ballasts, and fixtures become thoroughly heated and measurements indicate that the aluminum reflectors reach a temperature of 100° to 115° F — about the temperature of panel radiators. During the season when air conditioning is provided air enters the room from an outlet at 73° and at a rate of twelve changes per hour. This has kept the radiant heat from being excessive and it goes without saying that air conditioning is necessary to make this installation practicable during the warm months of the year.

Some preliminary studies have been made regarding mechanical ventilation of the space above the "trofferall" ceiling. It appears that this scheme could remove a large part of the long wave infrared, thereby decreasing the air conditioning requirements. It would be highly desirable to separate as much of the infrared from the visible energy

as possible in future lighting installations having this order of load density.

During cold weather it has not been necessary to use supplementary heating in the office. One can visualize buildings of the future where a lighting system is the principal source of heat as well as illumination. Although the lighting load affects the design of most present-day heating and air conditioning systems, it should be much more prominent in the designs of the future when lighting levels have advanced closer to the optimum.

Conclusions

It can be considered that at the footcandle levels indicated for these offices and with the brightness relationships established, higher level lighting can be acceptably comfortable for most office tasks. In order to maintain good direct-view comfort there must be either (1) use of increased shielding with louvers made of low-brightness materials (the deeper shielding angles of 52½° are recommended for lighting levels of the order described here), or (2) use of special controlling reflector and louver shapes.

It appears that, in general, the present I.E.S. reflectance recommendations for room and work surfaces which are based on comparatively low 50- and 100-footcandle installations are also satisfactory at several hundred footcandles. This appears to be further borne out by the expressed preferences of many visitors to these spaces. Almost universally the first described installation with the "floating panel luminaire" is regarded as acceptable. In the "trofferall" installation, a great many visitors select 200 to 300 footcandles as a level they would "like to have."

The matter of reflections from glossy surfaces can be helped by overlaying each louver panel with lightly diffusing media — plastic or glass. The problem of the amount of light coming into the eyes from below requires more study and experience and basic laboratory investigation.

The floating panel luminaire has much to recommend it: simplicity of installation, light on upper side walls, and the feeling of lightness and ceiling height.

It is hoped that this report on high level lighting installations will encourage others to make their own installations. The experiences to be gained in their use will certainly be helpful in planning for the high level installations of the near future which progress is sure to make practicable.

Reference

1. Baumgartner, G. R., Dorsey, R. T., and Linsday, E. A.: "Applications of Non-circular Cross-section Fluorescent Lamps." A paper presented at the National Technical Conference of the Illuminating Engineering Society, Sept. 9-13, 1957, Atlanta, Ga.

Discussion of I.E.S. Conference Papers

Discussion of papers presented at the technical sessions of the Atlanta Conference should be submitted immediately for publication with the paper in ILLUMINATING ENGINEERING.

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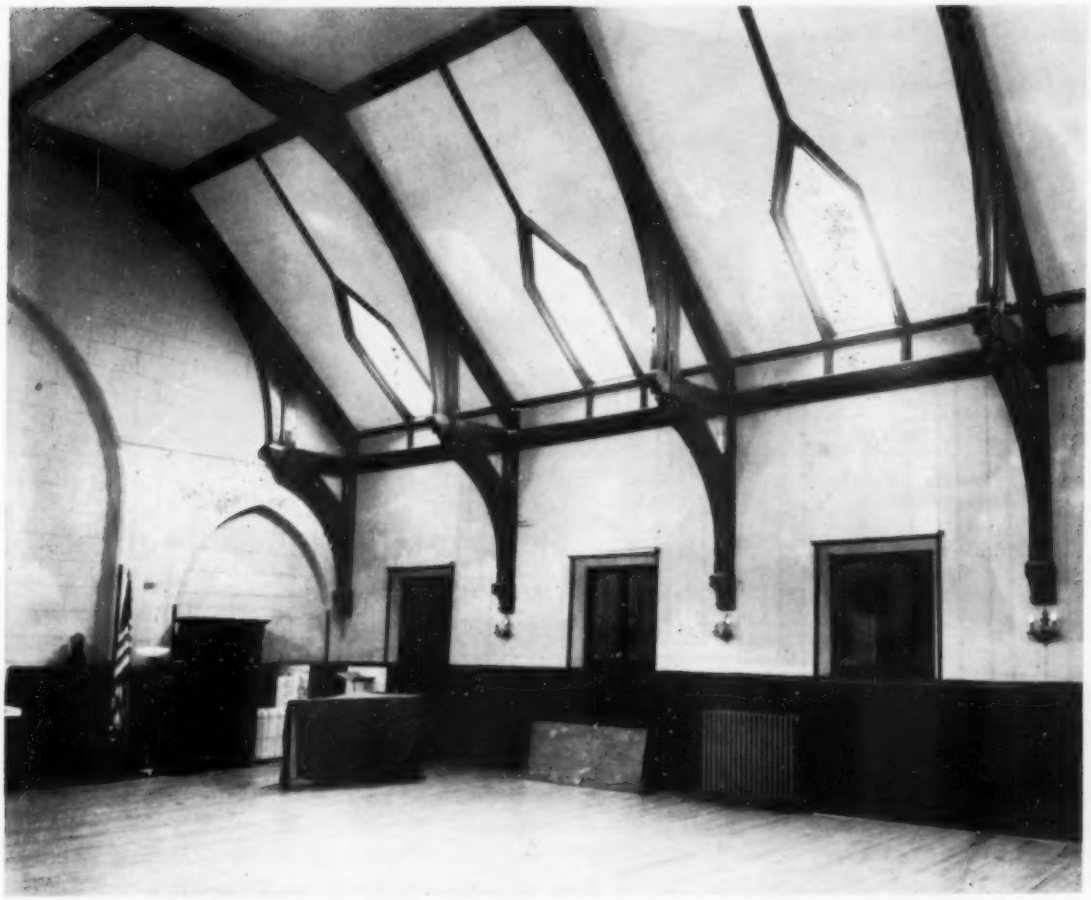

INSTALLATION AT GUILD HALL OF ST. PAUL'S EPISCOPAL CHURCH, MUSKEGON, MICH.

Lighting a Church Hall

LIGHTING OBJECTIVE: To provide comfortable general lighting for meetings, social gatherings and choir practice in a church hall.

GENERAL INFORMATION: This area is approximately 47 feet long and 33 feet wide with a ceiling height of near 24 feet in the middle and 15 feet at the side walls. The sloped portion of the ceiling is at a 45-degree angle. Colors and reflectances of the room surfaces are as follows:

ceiling	eggshell white	70% RF
walls	light buff	63% RF
dado	walnut stained oak	13% RF
floor	natural finish	44% RF

INSTALLATION: Relighting in this area was accomplished by converting eight dormer windows — four on each side, spaced on 12-foot centers — into fluorescent luminaires. This was done to keep

(over)

A.I.A. File No. 31f

the existing Gothic architectural appearance the same. Each "dormer luminaire" as shown in Fig. 2 was custom built by installing: a ¾-inch plywood backing, painted a flat white, inside the dormer; four fluorescent strip units (Guth catalog No. M5302/RS) each equipped with one 40-watt white rapid-start lamp; and Guth Gratelite plastic louver diffuser.

The average maintained illumination level is 12 foot-candles. Brightnesses are as follows:

ceiling	3 ft-L
walls	2 ft-L
dado	2 ft-L
floor	4 ft-L
"dormer luminaires" at 45° to plastic	260 ft-L

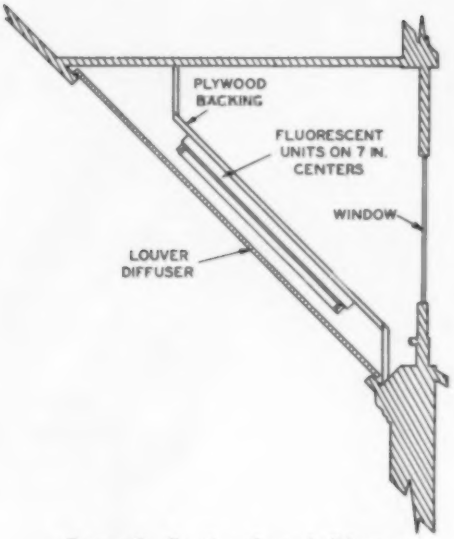

Figure 2. Section through "dormer luminaire."

Lighting designed by James Q. Miller, Consumers Power Co.; Contractor: Hall Electric Co., Muskegon, Mich.

Lighting data submitted by James Q. Miller, Consumers Power Co., Muskegon, Mich., as an illustration of good lighting practice and to aid in the design of similar installations.

Published by the Committee on Publications of the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

Lighting Extends

An Invitation to Learning

If statistics show a sudden upsurge in the amount of reading done by citizens of Hamilton, Ontario, it might well be due to the new Western Branch of the Hamilton Public Library. This new branch incorporates the environmental factors conducive to comfort: acoustical treatment, air conditioning and 75-100 footcandles (maintained).

The invitation to learning begins outside, with an extension of the corrugated acrylic luminous ceiling carried out five feet from the windows and then up at an angle of 60 degrees to the roof lines. To hold the plastic panels firmly in place, and to prevent dust, flies and moisture from getting inside the ceiling, the acrylic diffusers are pressed into white sponge rubber, riding in a track on top of the tee bar on the acoustical baffles.

The interior of the library is 102 by 28 feet with a ceiling height, from floor to plastic, of 10½ feet. Cavity depth above the ceiling is 32 inches. Lamps are mounted on 2 foot 10 inch centers over the plastic panels.

To make the ceiling entirely continuous, it was installed also over the area between the two swinging doors at the entrance. The difficulty of a build-up of pressure in the area was taken care of by the sponge rubber mounting feature.

The installation was calculated to give 75 to 100 footcandles maintained in service, using a coefficient of utilization of 48 per cent and a maintenance factor of 75 per cent.

Air conditioning adds its portion to the comfort of the library, with the conditioned air forced into the plenum, diffusing down into the room below. The air is taken off at the floor level on the side walls.

Installation by K. H. Walter and Associates, Consulting Engineers, and Stan Roscoe, Architect for the City of Hamilton. Bob Frank, of Wakefield Lighting Ltd., London, Ont., designed the sponge rubber mounting for the diffusers.

I.E.S. Guide for

Photometric Measurements Of Fluorescent Lamps

Prepared by the Subcommittee on Photometric Testing of Fluorescent Lamps of the Committee on Testing Procedures for Illumination Characteristics of the Illuminating Engineering Society

FOREWORD

The following guide replaces the 1948 guide titled "I.E.S. Guide for Photometric Testing of Fluorescent Lamps." Considerably more information has become available regarding the operation of fluorescent lamps, so that this revision becomes appropriate. A section on Color Measurement has been added.

SUBCOMMITTEE ON PHOTOMETRIC TESTING OF FLUORESCENT LAMPS

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1. General

(a) This guide describes the procedures to be followed and the precautions to be observed to obtain uniform measurements of fluorescent lamp photometric characteristics for rating purposes under standard conditions, when operated on alternating current. For special purposes, it may be desirable to determine fluorescent lamp photometric characteristics when they are operated at other than standard conditions. Where this is done, it must be remembered that such results are meaningful only for the particular conditions under which they were obtained. Brightness is usually calculated by a formula derived in the paper listed as Reference #22.

(b) The information usually required is total luminous flux or luminous intensity (candlepower) in one or more directions, and color. For the purpose of this guide, the determination of these data shall be considered photometric measurements.

(c) This guide should be used in conjunction with the "I.E.S. Guide for Electrical Measurements of Fluorescent Lamps" ("American Standard Guide for Electrical Measurements of Fluorescent Lamps") and the "I.E.S. General Guide to Photometry."

2. Power Supply Characteristics

2.1—*Waveshape* — The a-c power supply, while operating the test lamp, shall have a voltage waveshape such that the rms summation of the harmonic components shall not exceed three per cent of the fundamental.

2.2—*Voltage Regulation* — The line voltage shall be as steady and as free from sudden changes as possible. For best results, the voltage should be regulated to within ±0.1 per cent. If adequate automatic regulation is not available, constant checking and readjustment are essential if accurate measurements of photometric characteristics are to be obtained.

NOTE: If a voltage stabilizer is used, it is particularly important to check the wave shape to see that it meets the specifications given above in 2.1 — Waveshape.

3. Ambient Conditions

3.1—*General* — Photometric values probably are more sensitive to variations in ambient temperature or air movement than are the usual means of determining or controlling room air conditions. Means of exactly specifying the desired ambient test conditions have not yet been developed. Pending further investigation of ways and means of both specifying and controlling the necessary ambient conditions to provide reproducible measurements, the following conditions are currently considered as standard.

3.2—*Temperature* — The room in which lamp photometric measurements are being taken should be maintained at 25C (±1C); a tolerance of ±½C is desirable. This temperature should be measured at a point not more than five feet from the lamp and at the same height as the lamp. If the ambient temperature deviates from 25C by more than one-half degree, it should be so stated in the test report. If temperature corrections are applied, the correction factor should be stated in the report.

3.3—*Freedom from Drafts*—(a) The incidence of drafts on the surface of a lamp under test will substantially alter photometric values. Slight drafts which might easily escape normal observation can cause important changes in the measured values. When photometric measurements of fluorescent lamps are being made, extreme caution must be exercised to reduce air movement to a minimum if reproducible or accurate results are to be obtained.

(b) Lamps should be operated in a horizontal position when measurements are being taken to assure stabilized and uniform air convection over the lamp surface. Lamps must not, however, be operated in small enclosures where the bulb wall temperature of the lamp might be increased above normal.

Approved by the Council of the Illuminating Engineering Society, June 1957.

4. Ballasts

(a) When the photometric characteristics of a fluorescent lamp are being measured for rating purposes, the lamp should be operating in conjunction with a Reference Ballast of the appropriate rating and at specified volts. (The use of a ballast having different characteristics even though of the same impedance can materially alter the photometric values of the lamp.) The general characteristics of Reference Ballasts are described in the "American Standard Specification for Fluorescent Lamp Reference Ballasts," C82.3. This standard also gives the proper characteristics and application of the Reference Ballast corresponding to each of the lamp sizes for which lamp standards have been prepared.

(b) If photometric readings are to be taken of a lamp of a size for which no standard exists, the ballast used should comply with the general requirements of C82.3. The open circuit voltage should, for preheat lamps, be approximately twice the lamp voltage; and for instant-start lamps, three to three and one half times the lamp voltage. The ballast impedance should be selected for the required open circuit voltage.

5. Circuits

Circuits and instrumentation are described in the "I.E.S. Guide for Electrical Measurements of Fluorescent Lamps."

6. Lamp Connections

6.1—*Preheat-Start Lamps* — **(a)** Hot-cathode bipin base lamps are provided with two contact pins on each end of the lamp. One pin at each end is connected to the operating circuit, and the remaining two pins are connected to the starter circuit. For consistent results, each lamp should always be operated with the same two pins connected to the operating circuit. This includes not only the operation of the lamp while measurements are being taken, but also all other periods of operation prior to the time of measurement.

(b) One pin at each end of the lamp should be marked to indicate the operating circuit. The cross-over scheme is recommended as a standard procedure, but the parallel system, if consistently followed, will give equally satisfactory results. Fig. 2 in the "I.E.S. Guide for Electrical Measurements of Fluorescent Lamps" shows both schemes of connections.

6.2—*Instant-Start and Cold-Cathode Lamps* — No marking is needed for these lamps.

6.3—*Rapid-Start Lamps*—Until a more satisfactory procedure is developed, photometric measurements of rapid-start lamps should be made with the lamps operated as preheat lamps in accordance with Section 6.1(b). Under these conditions, statements of efficiency (lumens per watt) are not representative of operation with rapid-start ballasts.

7. Lamp Stabilization

(a) Before any measurements are taken, the lamp should first be burned long enough to attain stabilization and temperature equilibrium. A period of 15 minutes continuous burning usually is sufficient to accomplish this, but it is better to rely on periodic checks of lamp lumens, lamp volts, or both, rather than merely the elapsed time. When these values stop drifting, the lamp has reached equilibrium.

(b) If lamps are warmed-up on one ballast and then transferred to a different ballast for measurement, an additional period of burning in the measurement circuit is usually necessary to bring the lamp to equilibrium The length of the additional burning period can be kept to a minimum by transferring the lamp without extinguishing it, and also by using Reference Ballasts in the warm-up circuit. If the lamp is extinguished during the transfer, or if the warm-up ballast does not match the measurement ballast, the additional burning time in the measurement circuit will be longer, possibly as long as five or ten minutes. In transferring lamps from a warm-up position to the photometric equipment, care should be taken to maintain the same pin connections and orientation as during warm-up. Unless this precaution is followed, additional stabilization time will be required.

(c) No lamp which shows swirling or other abnormal behavior may be considered to be stabilized for measurement purposes. Swirling can usually be detected with the naked eye. However, there are also invisible or incipient swirls which can affect photometric measurements. These can usually be discovered by running a small permanent magnet along the length of the lamp. Any incipient swirling will evidence itself by a perceptible brightening at the spot where the incipient swirling exists. Turning the lamp off for approximately 15 seconds and restarting will usually eliminate the trouble. The lamps should be restabilized before measurements are made.

(d) Instant or cold starting of preheat fluorescent lamps may be conducive to lamp swirling. The use of a manual switch, by-passed by an appropriate condenser, will usually result in more stable operation than starting with the conventional glow switch type starter.

8. Photoelectric Cells

Physical photometry has replaced visual photometry in almost all applications. Receivers should be selected for spectral response, linearity and absense of fatigue. Photo emissive tubes and barrier-layer cells are both satisfactory, but the less complex circuit required by the latter is advantageous. A complete discussion of both types of cells and the requisite auxiliary equipment will be found in the "I.E.S. General Guide to Photometry."

9. Photometers

9.1—*Substitution Method* — Most practical photometric measurements are made by the substitution method. Standards should have characteristics similar to the lamp under test with respect to light output, physical size, shape and spectral energy distribution.

9.2—*Normal Candlepower* — Directional light output may be measured with one or more photoelectric cells at an appropriate distance from the lamp. The recommended minimum distance is five times lamp length. Total light output can be computed, but lumen/candlepower ratios are not well known for all sizes of lamps. The lamp should be burned in a horizontal position unless test requirements specify otherwise. Some possible sources of error which require consideration are:

(a) Light absorbing or reflecting material, including supports for lamp or photoelectric cell.

(b) Stray light.

(c) Ambient temperature and drafts. (These are more difficult to control than when a sphere is used.)

9.3—*Integrating Sphere*— This method gives total light output with one measurement. Drafts are minimized and temperature within the sphere is not subject to the fluctuations usually present in a temperature controlled room. If, however, the enclosure is small, accumulated heat from lamp or lamps under test may raise the temperature within the sphere. Unless substitution standards agree in spectral energy distribution with the lamps under test, the overall response of the photometer should follow the C.I.E. luminosity curve (see "I.E.S. General Guide to Photometry"). Some conditions which may affect best accuracy are:

(a) Reflection or absorption by supports for cell or lamps. (This may be very important unless strict substitution is observed.)

(b) Heat accumulation in sphere from lamp under test. (This may occur if the sphere is too small or left closed for extended periods.)

(c) Spectral response of cells and filters.

(d) Spectral response and condition of sphere paint.

(e) Cell positioning. (They should be aimed toward the sphere surface or adequately baffled so they receive no direct light.)

(f) Location of lamp in sphere. (Should be in center. Important unless strict substitution is observed.)

(g) The diameter of the sphere should be at least 1.2 times the length of the lamp.

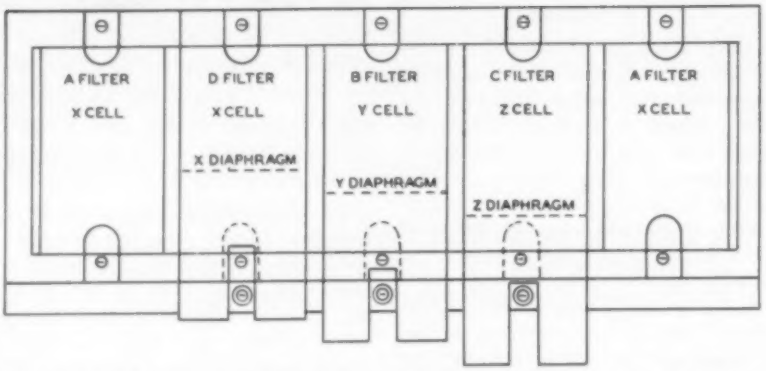

Figure 1. Colorimeter cells. The cells and filters are located in the cell housing as shown above.

10. Color Measurements

10.1—*General*— Fluorescent lamp spectra consist of continuous radiation plus mercury line radiation, therefore, the evaluation of color becomes somewhat complicated, and in the present state of the art, compromises must be accepted. In evaluating the color of lamps, there are two important factors to be considered; namely, color rendition and color appearance.

10.2—*Color Rendition*— This term is applied to that property of light which controls the color appearance of objects viewed under the specific light source. There is, at present, no generally accepted method of evaluating this property numerically. An indication of the comparative color rendition of any two light sources, may be obtained by viewing color samples under equal illumination from the two sources to be compared. The observer should be color-adapted to each source when observing the color appearance of samples lighted by it. Otherwise, he may confuse color differences resulting only from chromaticity or "whiteness" differences, with those resulting from differences in color rendition.

10.3—*Color Appearance*— Color appearance of lamps is specified in terms of the C.I.E. chromaticity coordinates. (A complete treatment of this subject can be found in the *I.E.S. Lighting Handbook*.)

10.4—*Measurement of Color Appearance*—(a) Numerical evaluation of color appearance is a complex subject, and complete understanding requires considerable study. Some of the important literature is listed in the accompanying bibliography.

(b) Measurements of color appearance can be made either with a spectroradiometer, or a Barnes type colorimeter. Spectroradiometers are expensive, require skilled operators, and considerable time for each measurement. The measurement technique for a Barnes type colorimeter is relatively simple, rapid, and sufficiently accurate for most requirements if the requisite precautions are observed. This colorimeter consists basically of photoelectric cells and filters, such that electrical responses to light of various wavelengths are proportional to the theoretical C.I.E. values of X, Y, and Z. From these data, the color coordinates x and y can be calculated by the formulae:

$$x = \frac{X}{X+Y+Z} \quad \text{and} \quad y = \frac{Y}{X+Y+Z}$$

The x and y values give an accurate color designation, but an alternate designation is frequently used. In this alternate system, the color is expressed by a number designating the correlated color temperature in degrees Kelvin; and a second number, indicating the departure from true blackbody locus. The latter figure is in units of the minimum perceptible color difference (MPCD) observable by the human eye under the most sensitive viewing conditions. The MPCD figure is preceded by a plus (+) if the shift is toward the green, and a minus (−) if toward the purple.

(c) Having calculated the x and y values of a light source, the designation in terms of color temperature and deviation from blackbody locus can be obtained by calculation, or from an expanded section of a C.I.E. chromaticity diagram on which the color temperature and MPCD coordinates have been superimposed.

(d) A Barnes type colorimeter usually consists of an assembly of cells, filters and diaphragms shielded by a box-like enclosure. The filtered cells and diaphragms are mounted in the enclosure, approximately twenty (20) inches from its viewing aperture. The aperture should be such that the cells view the full diameter of the fluorescent lamp under test, and about ten (10) inches of its center section. The distance from the plane of the aperture to the center line of the lamp is of the order of two (2) inches. The Y and Z components can be measured

with one filtered cell each, but the X component requires three such cells in parallel to obtain the theoretical X value. (See Fig. 1.) Diaphragms in front of the cells permit adjustment of the ratio of their responses. Cell output for the X, Y and Z values can be read on a microammeter or a current balance.

(e) Extraneous light must be excluded from the cells, and can be readily detected by turning off the lamp under test and checking for zero cell output. The ballast used for operating the lamp under test, may be an A.S.A. Reference Ballast or a commercial single lamp ballast selected to be within close limits of the A.S.A. rating for the type lamp under test.

10.5—*Adjustment*— (a) The exposed areas on the various cells of a colorimeter, required to make the instrument direct-reading, cannot be calculated with the required precision since the spectral sensitivities of cell-filter combinations ordinarily are determined at only eight wavelengths. After removing the top of the colorimeter box, it is easy to adjust the diaphragms step by step until the correct color coordinates are obtained on a particular standard lamp. The standard lamp is warmed up at least 12 minutes and the line voltage is held constant throughout the adjustments. A d-c milliammeter is inserted between the terminals provided for this purpose on the current balance, or in series with the auxiliary battery. The instrument current is held to an arbitrary fixed value. Thus, adjustments are made in terms of arbitrary instrument readings rather than adjusting the current in the main circuit of the current balance, so that the dials indicate color coordinates directly during the adjustment.

(b) The diaphragm on the cell with the "D" filter must be adjusted first. For this purpose, a 20-watt or 40-watt standard daylight fluorescent lamp is used. It must be located at the standard distance from the cells, and be lined up so that its axis intersects the axis of the colorimeter. Spectral intensity data on a lamp of this type show that the current from the cell with the "D" filter should be 18½ per cent of the total current from the two cells with "A" filters. To accomplish this adjustment, the "D" filter is covered with a piece of black paper, the selector switch of the current balance set on the X position (measuring the "A" filtered cells) and the reading at the balance position recorded. Then the black paper is removed, and the diaphragm on the "D" filtered cell adjusted until a current reading 1.185 times the reading with the "A" filter above is obtained.

(c) For the other adjustments, one may prefer to substitute a standard white fluorescent lamp. If so, the lamp is given an adequate warm-up and an X reading is taken. Then, if x, y and z are the color coordinates of the source, the diaphragm under the "B" filter is adjusted to make the Y reading equal (y/x) times the X reading. Similarly, the diaphragm under the "C" filter is adjusted to make the Z reading equal (z/x) times the X reading.

(d) If it is impossible to obtain enough current from one of the cells to fulfill the condition specified above, even when the diaphragm is removed from the cell, one must put a diaphragm under one of the "A" filters. In this case, the adjustment must be made in terms of the reading on the cell which needs no diaphragm. This reading is taken first. Let us suppose it is the Z reading. Then the diaphragm under the "B" filter is adjusted to make the Y reading equal (y/z) times the Z reading. Next, black paper is put over the cell which is under the "D" filter. Then the diaphragm which has been placed under one of the "A" filters is adjusted to make the X reading equal .81 times (x/z) times the Z reading. Now the black paper is removed and the diaphragm under the "D" filter is adjusted to make the X reading equal (x/z) times the Z reading.

(e) If one wishes to make the color-coordinate corrections for both daylight and white lamps small, rather than having them zero for a particular white lamp, preliminary adjustments of the diaphragm should be made on a lamp of one color and the readings taken on one of the other color. The effects of further adjustments of the exposed areas may be computed in advance by adjusting the corresponding color coordinates in proportion, then dividing the three adjusted values by their sum in order that the corrected coordinates shall add up to 1.000. Thus, one may find the optimum adjustment by computation. In making these final adjustments, one must be careful not to move the diaphragm under the "D" filter, since it determines the ratio of the X response for wavelengths less than 505 millimicrons to that for wavelengths greater than 505 millimicrons.

10.6—*General Suggestions*— (a) Line voltage must be maintained within very close limits while taking readings of X, Y, and Z. Any change in voltage between readings destroys the relationship, thus giving a false result. Actually, if a current balance is used, so that zero resistance is placed across the cells and the X, Y, and Z units connected in parallel, the total cell output is a measure of the light output of the lamp. Since these are photometric measurements, all of the precautions such as power supply characteristics, ambient temperature, lamp stability, drafts, etc., must be observed. Barnes colorimeter measurements are, in effect, photometric measurements.

(b) The section of the lamp being observed must be clean, since any surface deposit may be color selective. Color measurements usually are taken after the lamp has been burned 100 hours. Most types of lamps do not change color appreciably during life, but some types may show change.

(c) If a colorimeter could be adjusted to read absolute values of X, Y, and Z, no corrections of the readings would be necessary, but such accurate adjustment is not practical. Fluorescent lamps tentatively standardized for X and Y values based on visual assignments by the National Bureau of Standards are available. Using these lamps as standards, corrections can be applied to the colorimeter readings.

(d) All cell, bridge and switch connections must be kept very clean and tight, and the filters and cell windows free from dirt.

11. Test Report

The test report should list all significant data for each lamp tested together with performance data. The report should also list all pertinent data concerning conditions of testing, type of equipment and type of standard. Typical items that may be included are:

(a) Manufacturer's name and lamp designation.
(b) Purpose of test.
(c) Number of lamps tested.

(d) Rated electrical values of lamp type.
(e) Number of hours burned and operating cycle.
(f) Ambient temperature and temperature correction factor, if any.
(g) Lamp position during test.
(h) Type of standard used.
(i) Photometric method.
(j) Sphere diameter or test distance.
(k) Circuit conditions and fixed parameters.
(l) Lumen/candlepower ratio.
(m) Measured light output and electrical values (volts, amperes, watts) of each lamp and averages for group.
(n) Date and testing agency.
(o) Color data.

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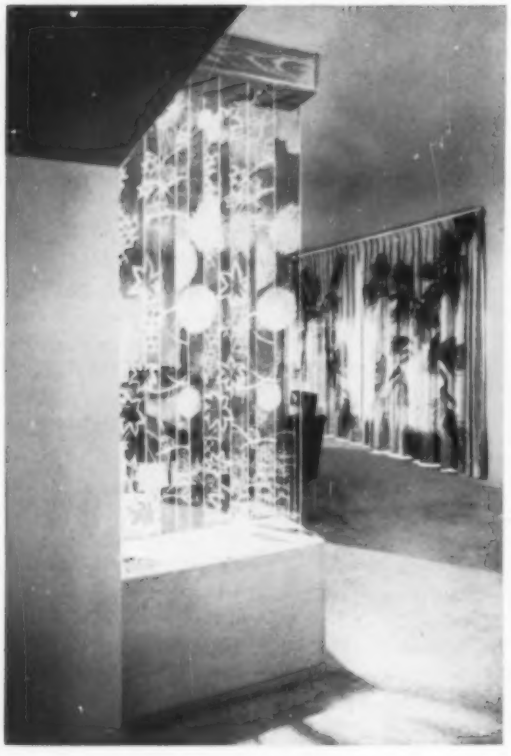

Edge-lighting Acrylic Panels

Room divider of hand-carved acrylic plastic panels, set in limed oak base and top support, is made even more decorative by edge-lighting from below. The six 76-inch by 8-inch by ⅜-inch plastic panels are mounted louvered over six 6-watt T-5 white fluorescent lamps in special channel.

The hand-carving of the panels was designed and made by Mrs. Cornelia Hayes, Marion, Ind., who, with the cooperation of C. T. Masterson, General Electric Co., also designed the edge-lighting system.

I. E. S. Council—1957-1958

The Council of the Illuminating Engineering Society is composed of the President, First and Second Vice-Presidents, General Secretary, Treasurer, two Past-Presidents, six Directors, and the eleven Regional Vice-Presidents, whose photographs appear on the following pages, each with the Section/Chapter Chairmen in his Region.

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George J. Taylor
Vice-President

J. B. Browder
Vice-President

R. G. Slauer
General Secretary

J. R. Chambers
Treasurer

R. F. Hartenstein
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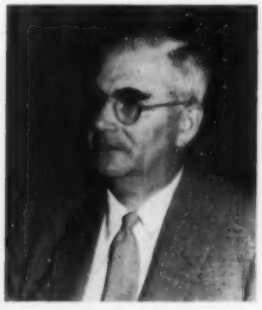
M. N. Waterman
Past-President

Brooks Chassaing
Director



G. F. Dean
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C. W. McCormick
Director

J. Dixon Mitchell
Director

A. C. Sangster
Director

J. D. Whitnell
Director

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J. Carl Wilson
Regional Vice-President
and a member of Council

(Photographs of G. J. Marshall, Chairman, Bluenose Chapter; Gerry Dubeau, Chairman, Quebec Chapter; D. A. Buckler, Chairman, Winnipeg Chapter, not available in time for publication.)

C. Roy Hodge
Chairman, Hamilton
Ontario Chapter

H. D. MacMackin
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Montreal Section

C. R. Thornton
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Ottawa Section

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Empire Chapter

Jack T. Cottingham
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Oregon Section

John C. Berg
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Sound Section

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Georgia Section

James W. White
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Palmetto Section

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Chairman, Southeast
Florida Section

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River Chapter

James J. Cardo
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Tar-Heel Section

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Lode Chapter

S. V. Monsees
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Clifford Ham
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Lloyd R. Boyles
Chairman, Central
Oklahoma Chapter

Thomas L. Moore
Chairman
North Texas Section

W. T. Walters
Chairman, Oil
Capital Section

(Photographs of Frank Donahue, Chairman, Panhandle Chapter; and Arthur Rice, Chairman, San Jacinto Section, not available in time for publication.)

1958 Regional Conferences, I.E.S.

Region	Place	Date
Northeastern	Statler Hotel Hartford, Conn.	April 10-11
East Central	John Marshall Hotel Richmond, Va.	April 14-15
South Central and Southeastern	Lafayette Hotel Little Rock, Ark.	April 24-25
Southwestern	Washington Youree Shreveport, La.	April 28-29
Midwestern	Hotel President Kansas City, Mo.	May 1-2
Inter-Mountain	Whitman Hotel Pueblo, Colo.	May 8-9
South Pacific	El Cortez Hotel San Diego, Calif.	May 14-15
Pacific Northwest	Multnomah Hotel Portland, Oregon	May 22-24
Great Lakes	Sheraton Hotel Rochester, N. Y.	June 23-24

LIGHTING NEWS

Lighting Developments Seminar Sponsored in Portland, Ore.

A three-day seminar on "Modern Developments in Lighting" was sponsored by the University of Portland and the Portland General Electric Co., August 26 through 28. School Lighting, Commercial and Industrial Lighting, and Residential Lighting were the three general topics covered. Sessions were held at the University of Portland.

Program and speakers were:

August 26 — School Lighting

Educational Implications of "The Child's Seeing Performance"—Richard Feinberg, Ph.D.
New Luminous Ceiling Developments — Dick Dilworth, Sylvania Electric Products, Inc.
Economics, Application and Maintenance of Fluorescent and Incandescent Light Sources Dwayne E. Seely, Westinghouse Electric Corp.; and Del Maulding and Jack Cottingham, Portland General Electric Co.
Economics of Sports Lighting — Dwayne E. Seely, Westinghouse Electric Corp.

August 27 — Commercial and Industrial Lighting

Efficient Seeing Is Good Business — Richard Feinberg, Ph.D.
Office Light Sources and Their Applications — G. Donald King and G. R. Barlogi, Sylvania Electric Products, Inc.
Industrial Lighting Applications — O. C. Westberg and Fred Farlye, Benjamin Electric Manufacturing. Co.
Industrial Lighting Economics — Ted Fitch, Portland General Electric Co.
Commercial Merchandising Applications and Economics — Walter E. Potter and W. Glenn Pracejus, General Electric Co.

August 28 — Residential Lighting

Creating a Safer, Fuller Life at Home Through Better Sight — Richard Feinberg, Ph.D.
Principles of Home Lighting Recipes — Kaye Leighton, General Electric Co.
Residential Luminaires and Portable Lamp Equipment — Kaye Leighton.
Garden and Outdoor Lighting—Kaye Leighton.

South Plains Chapter Approved

Establishment of the Society's 78th Chapter resulted from Council action at its meeting in Atlanta, Georgia, September 13. Upon petition by the active group of I.E.S. members in Lubbock, Texas, a charter was approved for the new organization, to be known as the South Plains Chapter. "Parent" group is the Amarillo Chapter, who encouraged the formation of the new Chapter and whose approval released members and territory.

Very successful local I.E.S. meetings have been held by the Lubbock group for several years now. A fresh surge of I.E.S. activity is expected to result with the formation of an official Chapter. Charter presentation is scheduled for an early Fall meeting.

Cornerstone Dedicated for Cleveland Engineering Center

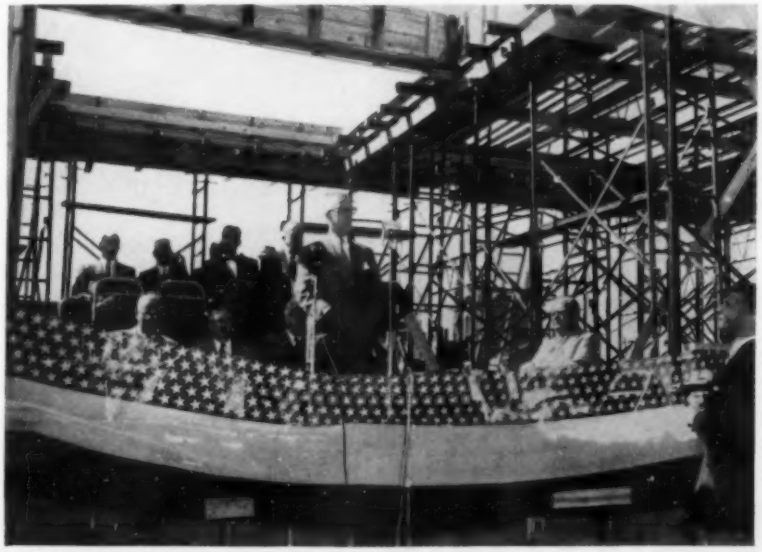
Ceremonies dedicating the cornerstone of the new Engineering and Scientific Center in Cleveland, Ohio, were held August 13. At the stone laying were Charles F. Kettering; the chief justice of the Supreme Court of Ohio; the Governor of Ohio; Edward Brown, president of the Cleveland Technical Societies' Council; and I.E.S. member Willard C. Brown, president of the Cleveland Engineering Society.

The new building, at Chester Ave. and East 30th St., is scheduled for completion next summer, at a cost of $1,525,000. It will be a center for the activities in education and development of those engaged in the technology of industry and research in the Cleveland area. The Center has been described as "valuable and significant recognition of the engineer and scientist by industry and the community that will, in turn, reward the area in terms of prosperity and progress throughout the years to come."

Gold Medal Nominations Due by January 1

Nominations of candidates for the 1958 Gold Medal Award are being sought by the Medal Award Committee, for consideration for next year's award. Such nominations must be received at Society headquarters by January 1, 1958.

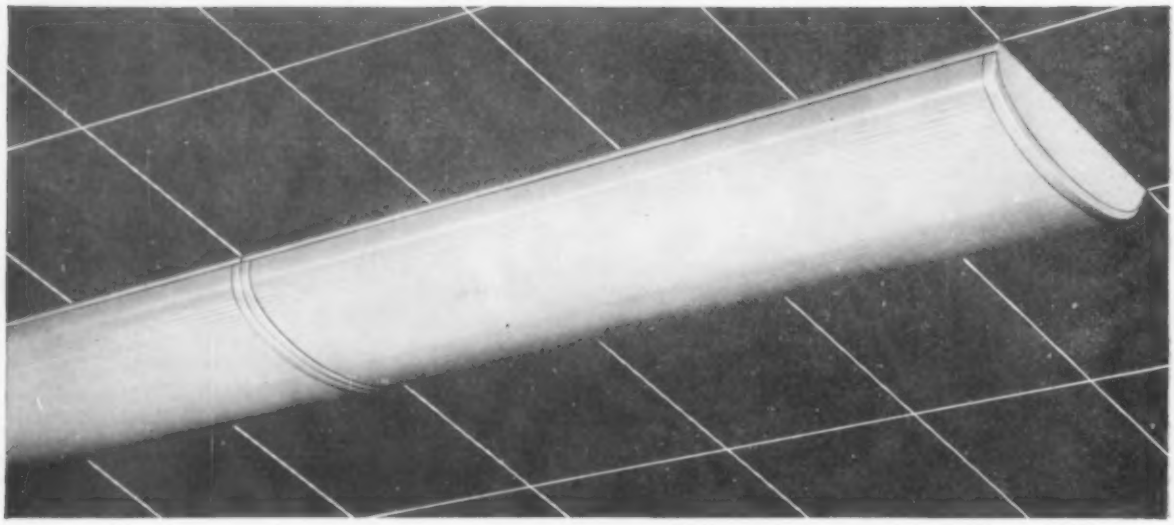
The I.E.S. Medal, highest honor in illumination, is for "meritorious achievement which has conspicuously furthered



AT THE laying of the cornerstone of the Cleveland Engineering and Scientific Center is Willard C. Brown, president of the Cleveland Engineering Society. Some 300 Cleveland civic and engineering leaders were gathered for the ceremony.

"Built-In" look...

Surface-Mounted Cost



GARCY Ultra-Lux . . . shallow, plastic enclosed fixture . . . ideal for low ceiling lighting

Minimum depth consistent with good light distribution and brightness control

With curved shield, unit is only 3¼" at its deepest point . . . yet surface brightness is virtually uniform at all viewing angles and well within acceptable limits for glare-free comfort.

Improved light-stable extruded plastic guaranteed not to warp or discolor

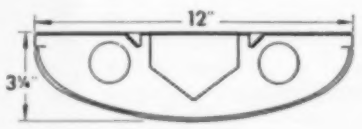
Shield is of Koppers improved EVENGLO*, a premium-grade polystyrene with built-in resistance to discoloration caused by ultra-violet radiation of fluorescent lamps.

Easy to install . . . only two basic parts

Completely assembled chassis with integral end plates is lightweight, sturdy, easy to handle. Separately cartoned one-piece shield hooks on after installation.

Easily cleaned . . . no need to remove shield from fixture

Curved shield is invisibly framed and hinged . . . lets down at a touch, wipes clean in seconds.



*EVENGLO is a registered trade mark of Koppers Company, Inc.

GARCY
Preferred for Performance
COMPLETE COMMERCIAL LIGHTING

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(*Continued from page 7A*)

the profession, art or knowledge of illuminating engineering."

Candidates for the award need not be members of the Society, nor citizens of the United States or Canada. Candidates may be nominated at any time by any member of the Society, by sending to the General Secretary at Society Headquarters the name of the individual whose accomplishments are deemed worthy of such recognition. These may be in the field of engineering design, applied illumination, optics, ophthalmology, lighting research, education, or administration and management.

In order for a candidate to be considered for the award in any given year, a letter requesting consideration of the proposed candidate must be delivered at the Society's headquarters office (1860 Broadway, New York 23, N. Y.) before January 1 of that year.

Summary of Conference To Be in November I.E.

The complete and illustrated report on the I.E.S. National Technical Conference, held in Atlanta, September 9-13, will appear in the Lighting News section of the November issue of ILLUMINATING ENGINEERING.

New Sustaining Members Elected

Two new Sustaining Members of I.E.S. were elected at the meeting of Council held in Atlanta, September 13. These are:

Metals Manufacturing Co.
58 West 1st South
Salt Lake City, Utah.
Official Representative: G. D. Segerstedt

Duke Power Co.
Power Building
Charlotte, N. C.
Official Representative: Roy A. Palmer

Dallas Will Be Site of 1962 National Technical Conference

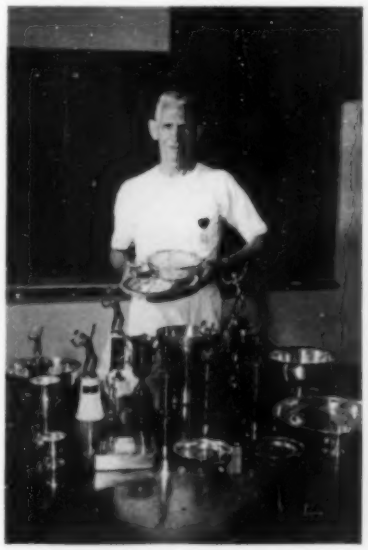
In line with the Society's policy of planning five years in advance, for National Technical Conferences, date and place for the 1962 Conference was approved by Council at its meeting in Atlanta, September 13. The national meeting that year will be held at the Statler-Hilton Hotel, Dallas, Texas. Tentative dates established were September 9-14, 1962.

Long range plans and invitations from at least two other Sections, are now being studied by the National Technical Conference Committee, Charles L. Amick, Chairman, for later report to Council on sites for the 1963 and 1964 conventions.

(*Continued on page 10A*)

Here and There with the I.E.S. President

On page 503 of this issue, incoming President Kirk M. Reid is described as a man of many interests. Here he is shown in some of his non-engineering activities, and the coming issues of I.E. will, without doubt, illustrate his versatility as I.E.S. President.



Tennis Champion . . .

On his chest, his first honor, a medal won in high school; on his racket, his most recent trophies, won last year; on the table, the fruits of championships won in the intervening years.

Figure Skater . . .

In costume on the ice as a performer in the feature, "Hunt Club Ball" — a highlight of the 1957 Carnival held by the Cleveland Skating Club, of which President Reid is a member.

and Forester.

Life and death in the forest. Grown tree, in photo at left, awaits the axe, for it is rotting at the center. Seedling being planted, in photo at right, will in five years be a good-sized Christmas tree. President Reid's 78-acre certified tree farm is located near Cleveland.

Plans Advancing for 4th National Electrical Week

The headquarters of National Electrical Week committee are expecting at least 250 state and local committees to be formed for the fourth annual observance of NEW on February 9-15, 1958, according to Chairman Merrill E. Skinner, Union Electric Co., St. Louis.

Mr. Skinner reports that the national committee received detailed reports on the 1957 observance from 177 state and local committees, which will form the basis for the 1958 planning guide and kit of materials to be distributed throughout the electrical industry during this October.

Basic purpose of the Week is "to focus attention on the contributions of electricity to our way of life."

Title shot for series.

Chicago Section Explains Light On TV Show

Members of the Chicago Section took to the air-waves recently when they appeared on a television program, Channel 11 in Chicago. The program, "This is Your Light," was part of a series called "Experts at Your Service."

Gerald Marks introduced the program and explained what an Illuminating Engineer does.

The photographs of the show, as seen at home, were taken by John Reynolds, Section member.

Ben Avery explaining light sources.

Clarence Clarkson explaining the relationship of the camera to the eye.

Gerald Marks explaining the relationship between the light source, the eye and the seeing task.

Midwestern Regional Vice-President Joseph Schneller speaking on the Illuminating Engineering Society.

Membership Committee Outlines Its Program

New goals for 1957-1958 were outlined to Council by Brooks Chassaing, Chairman of the Membership Committee at the Council meeting held in Atlanta September 13. They sum up to: election of 1600 new members; total gains of 1000 members (including turnover); a greater percentage of full Members in the total membership. As in previous years awards will be made in the four Groups to the winners in Gains and for a minimum of losses. The contest among the Regions also will be continued.

Section and Chapter Membership Committee Chairmen are already working on local plans to meet these goals; their outlines and ideas are to be studied by the national Membership Committee for immediate action. Mr. Chassaing stressed, of course, the need for participation of individual members all over the country, if the program is to succeed.

Live Better Electrically Issues Industry Activity Report

An industry report documenting how electric utilities, trade associations, electrical manufacturers and local businessmen are using the "Live Better Electrically" theme in their activities has been issued by Robert E. Boian, manager of the program.

This residential market development program, now half-way through its second year of operation, is being carried on at the local level by over 300 utilities. More than 180 manufacturers and 13 trade associations endorse and support the program. Headquarters for the project are at 205 East 42nd St., New York 17, N. Y.

Back Issues of I.E. Available

A complete file of *I.E.S. Transactions* and ILLUMINATING ENGINEERING from 1923 to 1956, to be sold as a set, is available from C. R. Tracy, 3318 Virginia St., Sioux City 4, Iowa.

Annual Fundamentals Course Offered by New York Section, I.E.S.

The basic course in Lighting Fundamentals, held for many years by the New York Section of I.E.S., is again this year being offered. The 12-week program which began September 24, is held at the Consolidated Edison Co., 4 Irving Place, New York 3, N. Y.

Instructors are T. S. Madonia, Westinghouse Electric Corp.; R. V. Smith, Holophane Co.; J. W. Hamilton, Day-Brite Lighting, Inc.; and H. J. Peters,

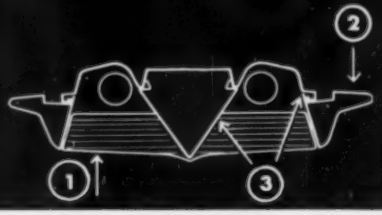
(Continued on page 15A)

NEW DAY-BRITE

PARAWING-2® ULTRA

WITH PARALOUVER LOUVERS

ULTRA COMFORT FOR LOW CEILINGS!
CONTROLS BRIGHTNESS MORE EFFECTIVELY
—EVEN IN THE "GLARE ZONE"



- For schools, offices, stores, wherever you need a shallow fixture
- Apparent depth only 2½ inches
- 4-foot and 8-foot units or sections
- For Rapid-Start and Slimline lamps

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

71184

DECIDEDLY BETTER
DAY-BRITE
Lighting Fixtures

1. Aluminum Paralouvers® have a surface of parabolic segments that direct light to the working plane.

2. Box-wing plastic side diffusers provide gradations of tone that blend into ceiling . . . are completely sealed against dirt, stay cleaner longer.

3. Center louver, top plates and inner wall combine to form efficient *Parabolic Profile* design.

FREE 8-PAGE PARAWING BOOKLET! Mail Coupon Today

Day-Brite Lighting, Inc.
5432 Bulwer Avenue, St. Louis 7, Missouri

Please send me _____ copy/copies of the new illustrated Parawing booklet.

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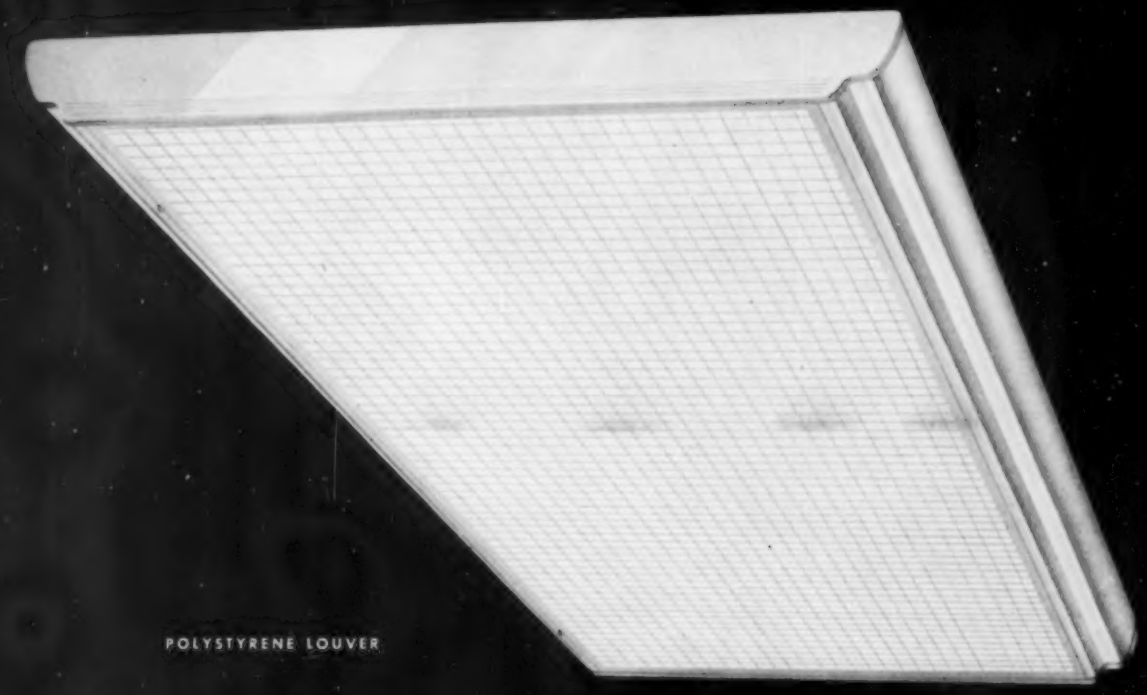
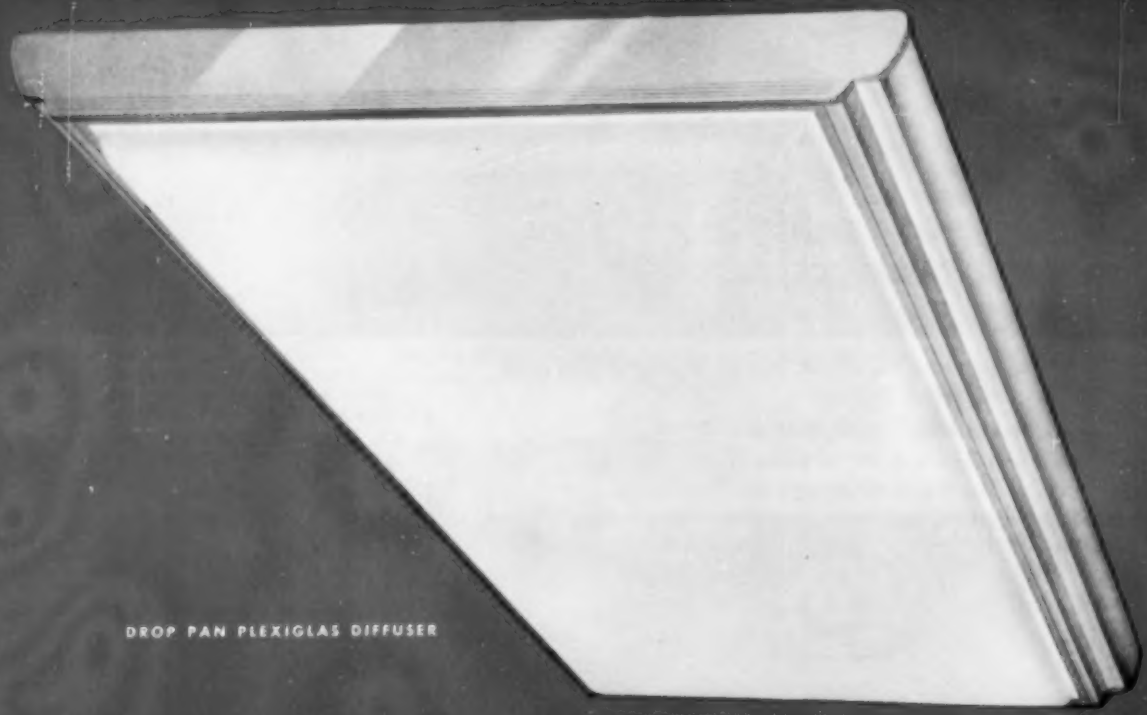


POLYSTYRENE LOUVER

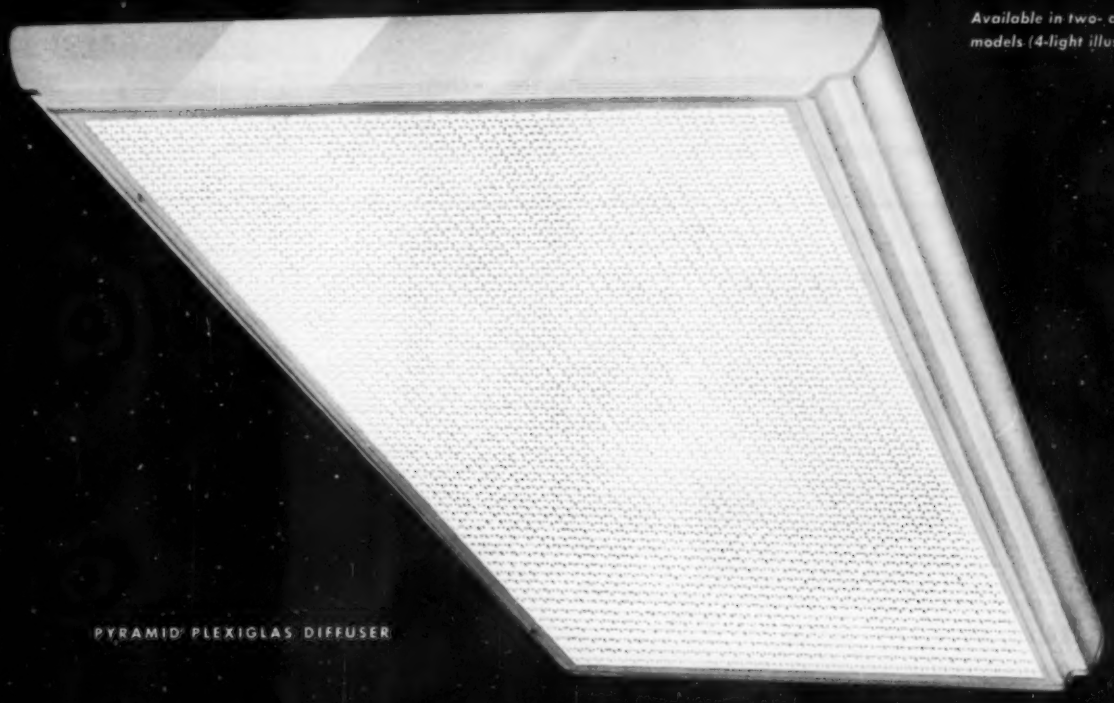


DROP PAN PLEXIGLAS DIFFUSER

Gibson LIGHTING

GIBSON MANUFACTURING COMPANY

IN CANADA manufactured under franchise by ELECTROLIER MANUFACTURING CO., LTD., Montreal, one of Canada's oldest and largest manufacturers of lighting fixtures.



Available in two- and four-light models (4-light illustrated).

the new Gibson Ceilo-35*

A fixture of incomparable beauty, designed expressly for low-ceiling application. Measures only 2¾" in depth and features exclusive parabolic reflectors which provide a smooth, shadowless panel of light.

Makers of the world's most versatile fixtures

ortho-77 88

You really ought to know more about it—so why not drop us a line now for complete information on the Ceilo-35?

*Patent Applied For

1921 Piedmont Circle, N.E., Atlanta 9, Georgia

Revere Outdoor Lighting Report

For lighting engineers, lighting planners, and architects interested in outdoor lighting problems and trends.

Lighting an Auto Sales Location

The Problem: To attract motorists' attention to the large number and type of new cars, and to dramatically illuminate building exterior. Frontage is 380 feet.

The Answer: Revere incandescent floodlighting, highlighting true color of cars. Two No. 4213-P floodlights are mounted 24 feet above grade with 31 feet spacing except for driveways. Thirteen 5-light cluster assemblies No. 3245 are mounted 9 feet above grade to add "sparkle" to cars on display. Floodlights use 1000-watt PS-52 clear lamps. Cluster lights use Par 38 150-watt lamps. For easy maintenance, 13 Revere 199-E-24 hinged poles support floodlights.

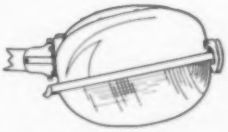
No. 4213-P Floodlights

No. 3245 Five-light cluster and splicebox

Lighting a City Street

The Problem: I.E.S. recommended *minimum* average footcandles not considered adequate for one of Chicago's heaviest travelled streets because of its high accident rate and low reflectance of newly paved blacktop surface. Design for uniform 3 footcandles average maintained illumination.

The Answer: Revere No. 2284 Endoval Type III street lighting luminaires with 400-watt E-H1 mercury lamps. Endovals with 10° tilt are mounted 29 feet above grade with 83 feet opposite spacing. Overhead wiring is used to take advantage of existing power after recent removal of street car line.

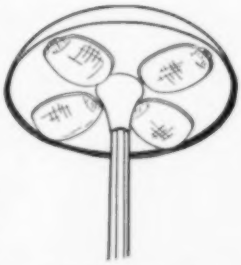


No. 2284 Type III Endoval

Lighting a Shopping Center Parking Lot

The Problem: To provide an attractively illuminated parking lot appealing to shoppers, and to enable those using the area to locate their automobiles easily and safely. Parking area is 240 feet by 106 feet.

The Answer: Three Revere No. 5440 Ultra-Lites mounted 34 feet above grade, and spaced on 70 foot centers, to provide an average illumination of 4 foot candles. Each Ultra-Lite uses four E-H1 400-watt mercury lamps positioned for widest coverage and highest illumination level. Ultra-Lites throw square light patterns which overlap to eliminate "dark spots" and build up light values in fringe areas.



No. 5440 Revere Ultra-Lite

No matter what the lighting problem — if it's outdoors, Revere has the equipment, or can engineer it, to provide your best lighting answer. Write for catalog covering Revere's complete line of matched outdoor lighting equipment.

Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

Industrial • Commercial • Service Stations • Streets • Sports • Airports • Shopping Centers

Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, Ill., UPtown 8-7100

Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto, Ontario

(*Continued from page* 10A)

Consolidated Edison Co. Topics covered are:

September 24 — Theory of Light and Vision
October 1 — Measurement of Illumination
October 8 — Illumination Calculations
October 15 — Light Sources I
October 22 — Light Sources II
October 29 — Light Sources III
November 4 — Design of Interior Lighting
November 12 — Office and School Lighting
November 19 — Store and Window Lighting
November 26 — Industrial Lighting
December 3 — Outdoor Lighting
December 10 — Maintenance and Economics

Tuition fee is $10 for members of I.E.S., A.I.A. and A.I.E.E.; $20 for non-members.

Dr. Langmuir Dies
World-Renowned Scientist

Dr. Irving Langmuir, world-famous scientist and Honorary Member of I.E.S., died at Falmouth, Mass., August 16, at the age of 76.

The Nobel-prize winning scientist had been with the General Electric Research Laboratory in Schenectady until his retirement in 1950. His historic service to lighting in developing the gas-filled incandescent electric lamp constituted an important step in improved health and reduced living costs of every contemporary American.

Dr. Langmuir's contributions to pure scientific knowledge are considered of the highest importance. His studies on electron emission and on gaseous discharges are regarded as classics. His experimentation with oil films on water uncovered an entirely new branch of chemistry.

For his accomplishments, Dr. Langmuir was awarded the Nobel Prize in chemistry in 1932. In addition to the gas-filled lamp, he developed the high-vacuum power tube, atomic hydrogen welding, a highly-efficient screening-smoke generator for the military, and methods for artificial production of snow and rain from the clouds.

Among scientific honors that were bestowed upon him, the Nichols Medal, awarded by the New York Section of the American Chemical Society, was twice given to Dr. Langmuir, once in 1915 for his work on chemical reactions at low pressures and in 1920 for his work on the atomic structure. The Hughes Medal of the Royal Society of London was awarded him in 1918 for his researches in molecular physics. In 1920 the American Academy of Arts and Sciences gave him the Rumford Medal for his thermionic researches and for his development of the gas-filled incandescent lamp.

In 1925 the Royal Academy of Lincei at Rome, Italy, bestowed upon him the Cannizaro Prize. In 1928 he was the recipient of the Perkin Medal, and in 1930 the Chandler Medal and the Willard Gibbs Medal. He was the first American industrial chemist to be awarded the Nobel Prize.

The Franklin Medal of the Franklin Institute and the Holly Medal of the American Society of Mechanical Engineers were awarded to him in 1934, and in 1944 he became the fourth American to receive the Faraday Medal of the British Institute of Electrical Engineers. The Mascart Medal of the Societe Francaise des Electricians was presented to him in 1950.

The Illuminating Engineering Society, as a part of its 50th Anniversary observance in 1956, made Dr. Langmuir an Honorary Member, the fifth scientist to be so honored.

(*Continued on page* 43A)

SCHEDULED EVENTS

October 10, 1957 — Annual Meeting, I.E.S., Society Headquarters, New York, N. Y.

October 7-11, 1957 — American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill.

October 8-10, 1957 — Electrical Progress Show, Convention Hall, Philadelphia, Pa.

October 9-11, 1957 — Canadian Electrical Manufacturers Association, Sheraton-Brock Hotel, Niagara Falls, Ont.

October 17, 1957 — Society of Plastics Engineers, Regional Technical Conference on "Polyethylenes," Hotel Carter, Cleveland, Ohio.

October 18-19, 1957 — Professional Engineers of Oregon, Eugene Hotel, Eugene, Ore.

October 21-25, 1957 — National Safety Council, 45th National Safety Congress & Exposition, Chicago, Ill.

October 26-31, 1957 — National Association of Electrical Distributors, (Semiannual Meeting), Edgewater Beach Hotel, Chicago, Ill.

October 27-30, 1957 — National Association of Electrical Distributors (Board of Governors), Skytop Lodge, Skytop, Pa.

October 28-29, 1957 — Annual Meeting, United States National Committee, International Commission on Illumination, Nittany Lion Inn, University Park, Pa.

Week of November 10, 1957 — National Electrical Contractors Association, Cincinnati, Ohio.

November 11-15, 1957 — National Electrical Manufacturers Association, Traymore Hotel, Atlantic City, N. J.

November 18-21, 1957 — 10th Exposition of the Air-Conditioning and Refrigeration Industry, Navy Pier, Chicago, Ill.

December 1-6, 1957 — The American Society of Mechanical Engineers, Annual Meeting, Hotel New Yorker, New York, N. Y.

December 12, 1957—Council Meeting, I.E.S., New York, N. Y.

January 20-24, 1958 — American Institute of Electrical Engineers, Winter General Meeting, New York, N. Y.

January 27-29, 1958 — American Society of Heating and Air-Conditioning Engineers, Incorporated, Annual Meeting, Pittsburgh, Pa.

February 9-15, 1958 — National Electrical Week.

February 13, 1958—Council Meeting, I.E.S., New York, N. Y.

February 20-21, 1958 — 14th Annual National Wiring Promotion Conference, Statler Hotel, Detroit, Mich.

March 2-5, 1958 — National Electric Sign Association, National Convention, Shamrock Hilton Hotel, Houston, Texas.

April 10-11, 1958 — Northeastern Regional Conference, Statler Hotel, Hartford, Conn.

April 14-15, 1958 — East Central Regional Conference, John Marshall Hotel, Richmond, Va.

April 24-25, 1958—South Central and Southeastern Regional Conference, Lafayette Hotel, Little Rock, Ark.

April 28-29, 1958 — Southwestern Regional Conference, Hotel Washington Youree, Shreveport, La.

April 30, 1958 — Council Meeting, I.E.S., Hotel President, Kansas City, Mo.

May 1-2, 1958 — Midwestern Regional Conference, Hotel President, Kansas City, Mo.

May 8-9, 1958 — Inter-Mountain Regional Conference, Whitman Hotel, Pueblo, Colo.

May 14-15, 1958 — South Pacific Coast Regional Conference, El Cortez Hotel, San Diego, Calif.

May 22-24, 1958 — Pacific Northwest Regional Conference, Multnomah Hotel, Portland, Oregon.

June 9-13, 1958 — National Association of Electrical Distributors, 50th Annual Convention, San Francisco, Calif.

June 12, 1958 — Council Meeting, I.E.S., New York, N. Y.

June 23-24, 1958 — Great Lakes Regional Conference, Sheraton Hotel, Rochester, N. Y.

June 23-27, 1958 — American Institute of Electrical Engineers (Summer General Meeting), Buffalo, N. Y.

August 17-22, 1958 — Illuminating Engineering Society (National Technical Conference), Royal York Hotel, Toronto, Canada.

August 19-22, 1958 — American Institute of Electrical Engineers, Pacific General Meeting, Sacramento, Calif.

October 13-15, 1958 — National Electronics Conference, Inc., Hotel Sherman, Chicago, Ill.

October 20-24, 1958 — National Safety Council (46th National Safety Congress & Exposition), Chicago, Ill.

October 27-31, 1958 — American Institute of Electrical Engineers (Fall General Meeting), Pittsburgh, Pa.

November 10-14, 1958 — National Electrical Manufacturers Association (Annual Meeting), Traymore Hotel, Atlantic City, N. J.

COMMITTEE PERSONNEL

COMMITTEES 1957-1958

All committees are appointed by the President, subject to approval of the Council and, except as provided in the Constitution, terminate at the time of the first Council meeting in each administration. The scope of each committee is indicated.

K. M. Reid, President, ex-officio member of all committees.

STANDING COMMITTEES

COUNCIL EXECUTIVE — To conduct the affairs of the Society between Council meetings.

K. M. Reid, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

BOARD OF FELLOWS — To evaluate the eligibility of candidates for transfer to grade of Fellow according to procedures approved by Council.

George E. Shoemaker, Chairman, Philadelphia Electric Co., 1000 Chestnut St., Philadelphia 5, Pa.

FINANCE — To have direct supervision of the financial affairs of the Society and to present to the Council an annual report on its financial condition. To make recommendations to the Council as to the investment of moneys and upon all specific appropriations. To prepare and submit for approval of Council not later than the October meeting a budget of income and expense for the ensuing fiscal year.

W. P. Lowell, Jr., Chairman, Sylvania Electric Products Inc., Salem, Mass.

GENERAL BOARD OF EXAMINERS — To investigate the qualifications of all applicants for admission to membership; to elect or reject applicants for the grade of Associate Member and Student Member, to report such action to the Council; and to make recommendation to the Council regarding applications for transfer or election to the grade of Member or Retired member, and for transfer to the grade of Member Emeritus.

Ralph H. MacVean, Chairman, Consolidated Edison — Westchester, 9 So. 1st Ave., Mt. Vernon, N. Y.

MEDAL AWARD — To evaluate the eligibility of candidates for award of the I.E.S. Medal according to procedures approved by the Council.

L. E. Tayler, Chairman, Detroit Edison Co., 2000 Second Ave., Detroit, Mich.

PAPERS — To procure, review and approve all technical papers and discussions thereof, for presentation before National Conferences of the Society.

H. F. Davidson, Chairman, Curtis Lighting of Canada, Ltd., 195 Wicksteed Ave., Leaside, Toronto, Ont.

Floyd W. Sell, Vice-Chairman, The Detroit Edison Co., 2000 Second Ave., Detroit, Mich.

PUBLICATIONS — To be responsible for the procurement, review and approval of all material for the publications of the Society other than technical papers approved by the Papers Committee for presentation at National Conferences of the Society and their discussions and committee reports, for which it will have publication responsibility only. Shall also be responsible for the editing, printing and business management of the publications of the Society; specific exceptions may be made by Council.

R. M. Zabel, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

GENERAL COMMITTEES

ADVANCE PLANNING — To study the operation, program, publication activities, membership classifications and financial structure with a view to its immediate and long-range objectives and to make recommendations to Council.

F. C. Winkler, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 1, Ohio.

A. C. Sangster, Vice-Chairman, The Detroit Edison Co., 2000 Second Ave., Detroit, Mich.

ADVISORY BOARD TO THE PRESIDENT — To examine the organization, accomplishments, and assignments of committees and prepare not later than July 1 of each year a proposed list of committees and personnel; and to evaluate costs and benefits of present and proposed Society services.

G. J. Taylor, Chairman, Day-Brite Lighting Inc., 161 E. 42nd Street, New York 17, N. Y.

ALLIED ARTS — To encourage and assist local competitions in allied arts, in cooperation with technical committees and interested local groups.

Karl A. Staley, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

J. D. Whitnell, Vice-Chairman, Arizona Public Service Co., P. O. Box 2591, Phoenix, Ariz.

BOARD OF NOMINATION — To prepare a nomination ticket containing the names of those who are deemed best suited to serve as officers and directors in positions to be filled at the ensuing election.

Duncan M. Jones, Chairman, Curtis Lighting Co. of Canada, Ltd., 195 Wicksteed Ave., Leaside, Toronto, Ont.

CONSTITUTION AND PROCEDURES — To prepare proposed amendments to the Constitution and By-Laws, to prepare statements of policies and procedures consistent with the Constitution and By-Laws, and to report to Council.

R. F. Hartenstein, Chairman, The Ohio Edison Co., Akron, Ohio.

DEFENSE COORDINATING — To contact various Government Agencies concerned with National Security suggesting cooperation and participation in specific projects as an aid to solution of their problems. Recommending the placement of lighting study projects in present committees or the appointment of study project committees to the Society President and to expedite such study projects and guide accepted reports into proper Government Channels.

J. W. Bateman, Co-Chairman, Canadian General Electric Co., Ltd., 212 King Street, W., Toronto, Ont.

A. F. Wakefield, Co-Chairman, The Wakefield Co., Vermilion, Ohio.

HISTORICAL — To assemble and make available for current reference and to prepare in suitable and durable form for posterity, such historical facts, printed memorabilia, photographs, voice records, museum specimens and allied items as may be judged worthy of composing a continuing digest of the record of the Society's history.

S. G. Hibben, Chairman, 31 Clinton Ave., Montclair, N. J.

S. B. Williams, Vice-Chairman, Brooks Street, Jamestown, R. I.

J. L. Stair, Secretary, Harbert, Berrien County, Mich.

LIGHTING SERVICE — To stimulate and promote the discussion and practical application of lighting recommendations and to conduct a Lighting Service Forum in connection with the National Technical Conference.

C. W. McCormick, Chairman, Connecticut Light & Power Co., P. O. Box 2010, Hartford, Conn.

MEMBERSHIP — To develop plans and supervise the operation of the individual membership activity of the Society.

Brooks Chassaing, Chairman, Day-Brite Lighting Inc., 5411 Bulwer Ave., St. Louis 7, Mo.

J. C. Forbes, Vice-Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

NATIONAL TECHNICAL CONFERENCE — To be completely responsible, subject to the approval of Council, for the general coordination of all conference activities, for selecting and recommending time and place, for review of the plans and budgets of the National Technical Conference Executive Committee, and in cooperation with the Papers Committee for the satisfactory time allocation for the Technical Papers sessions, according to Procedures and Policies as adopted by Council.

C. L. Amick, Chairman, Day-Brite Lighting Inc., 5411 Bulwer Ave., St. Louis 7, Mo.

PUBLIC RELATIONS AND INFORMATION — To prepare and disseminate information about the activities, accomplishments, programs, objectives and policies of the Society and about the place of illuminating engineering in modern society; to formulate and submit public relations policies and plans for the Society.

J. R. Chambers, Chairman, Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

W. A. Dalrymple, Vice-Chairman, Amalgamated Electric Corp., Ltd., 384 Pape Ave., Toronto, Ont.

REGIONAL ACTIVITIES — To represent the respective Regions before the Council and to keep the Council informed regarding the affairs of the Regions. To stimulate Society activities, to encourage joint meetings of Sections and Chapters including Regional Conferences within the respective Regions, and to promote the expansion of the Society.

J. B. Browder, Chairman, Georgia Power Co., 75 Marietta St. N.W., Atlanta 1, Ga.

RESIDENCE LIGHTING FORUMS — To stimulate and assist the Residence Lighting Forums of the Society and to encourage the formation

(*Continued on page* 19A)

JEFFERSON
CONSTANT WATTAGE
INDOOR MERCURY LAMP BALLASTS

CONSTANT WATTAGE GIVES YOU:

- *Constant light output*—maintained within ±2%, even if line voltage fluctuations reach ±13% . . . more ballasts per circuit . . . wide range of primary voltages eliminates need for primary taps.
- *Fewer failures*—Low extinguishing point minimizes outages due to voltage dips.
- *Longer lamp life*—with surges in line voltage not transmitted to bulb, shortened bulb life from this cause is eliminated.
- *Lower installation costs*—the current required for starting is less than normal, so fuses and breakers can be lower capacity, and wiring lighter—savings in installation and upkeep.

THE NEW ***Jefferson*** BALLASTS

With years of experience producing thousands of outdoor constant wattage transformers, Jefferson now makes available a new and complete line of indoor constant wattage ballasts for mercury lamp operation . . . another product of Jefferson advanced engineering skill.

construction features:

- These new ballasts are suitable for either wall or pendant mounting.
- Large, roomy double wiring compartments in all models makes installations fast and easy.
- ½" and ¾" knockouts on top, bottom, and sides of case.
- Easy-to-follow schematic diagram shown on the nameplate of each case.

HIGH POWER FACTOR CONSTANT WATTAGE BALLASTS

CATALOG NUMBER	LAMP WATTAGE	LAMP TYPE	LINE VOLTS	LINE AMPS	INPUT WATTS
237-261	100	H-4	100-130*	1.1	120
237-281	175	H-22	100-130*	1.85	205
237-871	250	H-5	100-130 200-260†	2.50 1.25	285
237-821	400	H-1	100-130 200-260†	4.00 2.00	445
237-901	(2) 400	(2) H-1	100-130 200-260†	7.60 3.80	870
237-761	700	H-18	100-130 200-260†	6.80 3.40	770
237-101	1000	H-12	THIS UNIT AVAILABLE JAN. 1, 1958		
237-111	1000	H-15	THIS UNIT AVAILABLE JAN. 1, 1958		

*Also available in the following ratings: 200-260, 240-315, 400-520

†Also available in the following ratings: 240-315, 400-520

Jefferson CONSTANT WATTAGE MERCURY LAMP **BALLASTS**

JEFFERSON ELECTRIC COMPANY • BELLWOOD, ILLINOIS

Bulletin L571-6.1 (new)

(*Continued from page* 16A)

of additional Forums. To conduct a Residence Lighting Forum in connection with the National Technical Conference.

Virginia Skinner, Chairman, Long Island Lighting Co., Old Country Road, Mineola, L. I., N. Y.

SUSTAINING MEMBERSHIP — To develop plans and supervise the operation of the Sustaining Membership activity in the Society according to the Procedures and Policies adopted by Council.

C. C. Keller, Chairman, The Holophane Co. Inc., 342 Madison Ave., New York 17, N. Y.

TRUSTEES, I.E.S. HEADQUARTERS RETIREMENT PENSION PLAN

R. F. Hartenstein, Chairman, The Ohio Edison Co., Akron, Ohio.

TASK COMMITTEE ON HEADQUARTERS LOCATION — To study all factors affecting choice of future location of Society Headquarters and to submit a recommendation to Council.

M. N. Waterman, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

TASK COMMITTEES

I.E.S. - U. S. PUBLIC HEALTH SERVICE — To outline a method of making a survey of the visual factors of the working environment and the workers' vision and evaluating the findings in terms of visual comfort and effectiveness and eye health.

J. F. Parsons, Chairman, Niagara Mohawk Power Corp., Electric Bldg., Buffalo 3, N. Y.

SIGN LIGHTING — To study the lighting of signs, both exterior and interior and report thereon.

C. N. Laupp, Chairman, Wisconsin Electric Power Co., 231 W. Michigan St., Milwaukee, Wis.

TECHNICAL COMMITTEES

AVIATION — To study the application of light and lighting to the spaces and functions involved in the operation of aircraft.

L. C. Simpson, Chairman, AGA Division, Elastic Stop Nut Corp. of America, P. O. Box 38, Elizabeth, N. J.

M. A. Warskow, Vice-Chairman, Port of N. Y. Authority, 111 Eighth Ave., New York 11, N. Y.

R. J. Stefany, Secretary-Treasurer, Westinghouse Electric Corp., Bloomfield, N. J.

Aircraft Cabin Lighting

W. E. Woodson, Chairman, Convair Division, General Dynamics Corp., Human Engrg. Group, P. O. Box 1950, San Diego 12, Calif.

Aircraft Cockpit Lighting

T. O. Twist, Chairman, National Bureau of Standards, Washington 25, D. C.

Aircraft Exterior Lighting

R. A. Stone, Chairman, Airline Pilots Assn., 55th St. & Cicero Ave., Chicago 88, Ill.

Airport Runway Lighting

C. A. Douglas, Chairman, National Bureau of Standards, Washington 25, D. C.

Airport Service Area Lighting

E. B. Karns, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland, Ohio.

Airport Taxiway Lighting

L. C. Vipond, Chairman, Office of Airports, CAA, Washington 25, D. C.

Approach Lighting

O. F. Farris, Chairman, Office of Air Navigation Facilities, CAA, Washington 25, D. C.

Aviation Lamps (Large)

R. J. Stefany, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

Aviation Lamps (Miniature)

M. A. Mortensen, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

Bibliography

F. C. Ashe, Chairman, Kopp Glass, Inc., Swissvale, Pa.

Definitions and Terms

J. F. Angier, Chairman, 14 Valley View Ave., Washington 12, D. C.

Heliport Lighting

V. E. Converse, Chairman, Port of N. Y. Authority, 111 Eighth Ave., New York 11, N. Y.

Papers

F. C. Breckenridge, Chairman, National Bureau of Standards, Washington 25, D. C.

Seadrome Lighting

A. L. Lewis, Chairman, Bureau of Aeronautics, Dept. of the Navy, Washington 25, D. C.

COLOR — To study, evaluate and report on the effect of color in relation to the art and science of illumination.

R. C. Allison, Chairman, Engineering and Design Dept., The T. Eaton Co. Ltd., Toronto 1, Ont.

DAYLIGHTING — To study the problems involved in daylighting, develop recommended practices and report thereon.

H. B. Vincent, Chairman, Owens-Illinois Glass Co., Technical Center, 1700 N. Westwood Ave., Toledo, Ohio.

J. W. Griffith, Vice-Chairman, Southern Methodist University, Dept. of Engineering Research, Dallas, Texas.

Availability of Daylight (Exterior)

B. F. Greene, Chairman, 100 W. 42nd St., New York, N. Y.

Brightness Ratio Measurement

J. W. Griffith, Chairman, Southern Methodist University, Dept. of Engineering Research, Dallas, Texas.

Coordinating

R. A. Boyd, Chairman, Research Engineering Institute, University of Michigan, Ann Arbor, Mich.

Revision of Recommended Practice for Daylighting

R. W. McKinley, Chairman, Pittsburgh Plate Glass Co., 1 Gateway Center, Pittsburgh 22, Pa.

DESIGN PRACTICE — To study published data on coefficients of utilization, room indexes, maintenance coefficients and other elements entering into calculations for lighting design; develop standard methods for use in Society publications and report thereon.

G. W. Clark, Chairman, Sylvania Electric Products Inc., Wheeling, W. Va.

EDUCATION — To prepare educational and training material on fundamental and advanced concepts of light and illumination, and to further its adoption in courses conducted by Sections and Chapters, or others; to study and encourage lighting education and training for professional careers in schools, colleges and elsewhere.

Alston Rodgers, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

HANDBOOK REVISION—To revise and arrange the technical content of the Handbook; to lay out, plan and arrange for development of individual sections primarily through appropriate technical committees; to consult with the Publications Committee on its presentation of a suitable publication budget for Council approval; to be responsible to Council for the accuracy and treatment of material including the format and paging.

J. J. Neidhart, Chairman, The Miller Co., Meriden, Conn.

IES-ASAE (AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS) JOINT COMMITTEE ON FARM LIGHTING

IES-ASHAE (AMERICAN SOCIETY OF HEATING & AIR-CONDITIONING ENGINEERS) JOINT COMMITTEE

INDUSTRIAL — To initiate, follow up and coordinate lighting study projects in the industrial field, review the reports of the various subcommittees in this field and make recommendations to Council.

W. H. Kahler, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 1, Ohio.

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LIGHT CONTROL AND EQUIPMENT DESIGN— Collect and correlate the knowledge and data on means and methods of controlling, directing, reflecting, transmitting and diffusing light

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and on the principles and practices of equipment design.

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Milton Buzan, Secretary, Day-Brite Lighting, Inc., 5411 Bulwer Ave., St. Louis, Mo.

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George Freeman, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

Color Rendition

Dorothy Nickerson, Chairman, 2039 New Hampshire Ave. N. W., Washington 9, D. C.

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R. P. Teele, Chairman, National Bureau of Standards, Washington 25, D. C.

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OFFICE — To study the lighting requirements of office lighting tasks, develop suitable lighting recommendations and report thereon.

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James F. Angier, Chairman, 14 Valley View Ave., Washington 12, D. C.

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M. W. Ross, Secretary, Commonwealth Edison Co., 72 W. Adams St., Chicago 90, Ill.

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Roadway Lighting Principles

Charles H. Rex, Chairman, General Electric Co., Outdoor Lighting Dept., Hendersonville, N. C.

Standard Practices

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Tunnels and Underpasses

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Visibility Under Fog Conditions

Ellis E. Paul, Chairman, Howard Needles, Tammen & Bergendoff, 55 Liberty St., New York 5, N. Y.

TECHNICAL COMMITTEE FORUM — To coordinate procedures of the technical committees of the Society.

G. J. Taylor, Chairman, Day-Brite Lighting, Inc., 161 E. 42nd St., New York, N. Y.

THEATER-TELEVISION — To study and report on the lighting for theatrical presentations and for production of television programs.

Joel E. Rubin, Chairman, Kliegl Bros., 321 W. 50th St., New York, N. Y.

TESTING PROCEDURES FOR ILLUMINATION CHARACTERISTICS — To prepare standard test procedures for illumination characteristics of light sources, lighting equipment and illumination materials, and to report thereon.

Phelps Meaker, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

General Guide to Photometry

R. P. Teele, Chairman, National Bureau of Standards, Washington 25, D. C.

Guide for Brightness Measurements

Paul H. Lamson, Chairman, Smithcraft Lighting Division, 217 Everett, Chelsea 50, Mass.

Guide on Colorimetry

R. P. Teele, Chairman, National Bureau of Standards, Washington 25, D. C .

Guide for Electrical Measurements of Fluorescent Lamps

George A. Meyers, Chairman, Sylvania Electric Products, Inc., 75 Sylvan St., Danvers, Mass.

Guide for Electrical Measurements of Mercury Vapor Lamps

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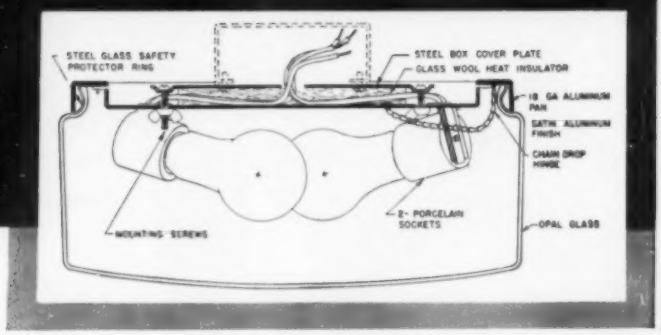

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- Globe opens on **hinge** for quick easy cleaning and relamping.
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HH-11	10″	2- 60 W
HH-13	12″	2- 75 W
HH-15	14″	2-100 W
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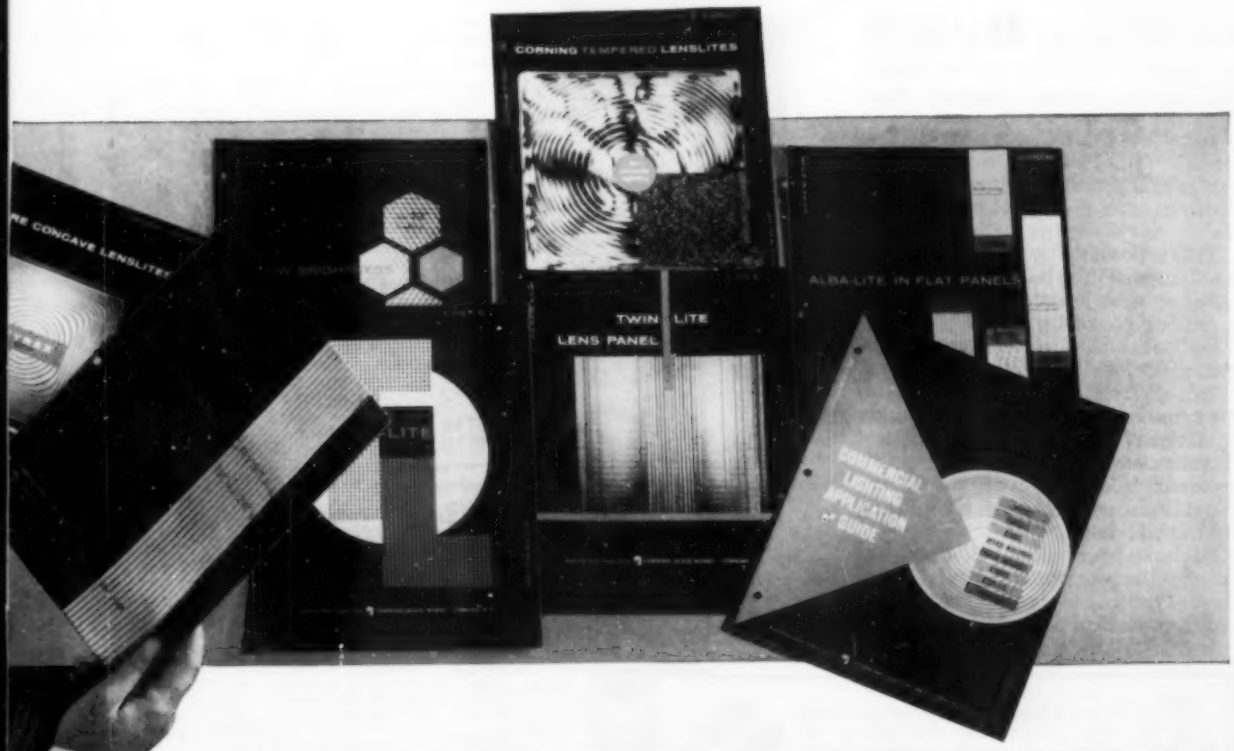

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Please send me the following material: "Commercial Lighting Application Guide" ☐; "Engineered Lighting Glassware" ☐; "Pattern No. 70 Low Brightness Lens Panel" ☐; Low Brightness Curved Lens Panel ☐; "Pattern No. 83 Crysta-Lite for 12" and 24" toffers" ☐; "Alba-Lite in Flat Panels" ☐; "Toffer Curved Alba-Lite Panels" ☐; "Twinlite Lens Panels" ☐; "Foto-Lite" ☐; "Square Concave Lenslites" ☐; "Corning Tempered Lenslites" ☐.

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If your fluorescent lamp sizes are on

THIS LIST

then there now are ballasts to give you up to

One Third More Light!

DOUBLE-LONG LAMP LIFE!

Westinghouse

HIgh-EFFiciency BALLASTS

are co-ordinated to specific electrical requirements of each particular fluorescent lamp!

If your fluorescent lamps are on this list (at right) then you, too, can save *appreciable* amounts of money! — in lighting costs! — in prolonged lamp-life!

This is possible because *all* fluorescent lamps require ballasts *specifically suited* to *each* lamp's *own particular* operating characteristics!

Ballasts *unsuited* to given lamps can *reduce their light-output one-third!* — can *often* cut *lamp-life in half!* And the same is true of ballasts seemingly "matched" well enough — but not manufactured up to the standards necessary for those included in the Westinghouse HIgh-EFFiciency BALLAST list!

So, have your ballasts checked—at *the very first good opportunity!*—for *all three* of the following seals that distinguish *economical* ballast performance!

J-04421

This Underwriters Laboratories Seal means that the ballast on which it appears is electrically *safe!*

This Certified Ballast Manufacturer's Seal means that the ballast meets rigid technical operating requirements.

This Westinghouse seal means that ballasts so identified *fulfill or exceed all CBM requirements!* — are warranted the distinction of inclusion on the Westinghouse HIgh EFFiciency BALLAST list — *yet cost no more* than ballasts that *may* be *wasting 1/3 your lighting potential! — that may be "killing" your lamps mid-way in their service life! Look* for the *Westinghouse* seal!

YOU CAN BE SURE... IF IT'S Westinghouse

Westinghouse

HIgh-EFFiciency BALLASTS

available now for all the following lamps:

LAMP TYPE	LAMP WATTS	CIRCUIT VOLTAGE
preheat		
40T12	1-40	118 v
40T12	2-40	118 v
40T12	2-40	277 v
40T12	3-40	118 v
90T17	2-90	118 v
90T17	2-90	265 v
90T17	4-90	265 v
rapid start		
40T12 rs	1-40	118 v
40T12 rs	1-40	265 v
series • 430 ma		
40T12 rs	2-40	118 v
40T12 rs	2-40	277 v
series • 800 ma		
48T12 rs	2-60	118 v
48T12 rs	2-60	277 v
96T12 rs	2-100	118 v
96T12 rs	2-100	265 v
slimline — 425 ma		
48T12	1-38	118 v
48T12	1-38	265 v
72T12	1-55	188 v
72T12	1-55	277 v
96T12	1-74	118 v
96T12	1-74	277 v
lead-lag		
48T12	2-38	118 v
48T12	2-38	277 v
72T12	2-55	118 v
72T12	2-55	265 v
96T12	2-74	118 v
96T12	2-74	265 v
series		
72T12	2-55	118 v
72T12	2-55	277 v
96T12	2-74	118 v
96T12	2-74	265 v

For special requirements not listed above, contact your nearest Westinghouse office, your own local Westinghouse Distributor, or write to Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio.

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(*Continued on page* 48A)

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Modern glass has many useful properties which when properly engineered provide highly-desirable products for industrial use.

Kopp engineers proportion and mix these properties, as a chef creates a new recipe, to provide an innumerable family of quality products. They are then put through a series of exacting tests—some to destruction—to determine their maximum application values. Production, the same as designing, is carefully controlled to assure products of utmost dependability and performance.

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Call us today about your specialized glass needs. Our engineering department will be glad to help you.

KOPP GLASS

KOPP GLASS, Inc.

Swissvale, Pennsylvania

Now you can operate <u>two</u> H-1 400-watt outdoor mercury vapor lamps from a <u>single</u> Sola Constant Wattage Ballast

Operating advantages embodied in the Sola Constant Wattage Mercury Vapor Lamp Transformer have proved so desirable and practical that this type of ballast is fast becoming the generally-accepted standard for mercury vapor lighting installations. Now constant wattage operation plus the economy of two-lamp ballasting is available in a single Sola CW Mercury Vapor Lamp Transformer.

This new design is specifically for two-lamp, outdoor service in commercial and industrial applications of H-1 400-watt mercury vapor lamps. Its famous Constant Wattage Principle of operation offers users the following performance features:

- *Low starting current surge*
- *Regulated lamp wattage and light output*
- *Open circuit protection*
- *Elimination of need for primary taps*
- *No extinguishing on line voltage dips*
- *Extended lamp life*

For additional information on your particular application, contact your sales engineer listed below. He's one of a nationwide organization maintained by Sola Electric Co. to provide you with prompt service.

SOLA *Mercury Vapor Lamp* **TRANSFORMERS**

Write for Bulletin 3J-MV-244
SOLA ELECTRIC CO., 4633 W. 16th St., Chicago 50

CONSTANT VOLTAGE TRANSFORMERS • LIGHTING TRANSFORMERS • CONSTANT VOLTAGE DC POWER SUPPLIES
SOLA ELECTRIC CO., 4633 West 16th Street, Chicago 50, Illinois, Bishop 2-1414 • BRANCH OFFICES: Boston, Mass.; Cleveland, Ohio; Kansas City, Mo.; Los Angeles, Calif.; New York, N. Y.; Philadelphia, Pa.; San Francisco, Calif.; Wallingford, Conn. • *Representatives in Other Principal Cities*
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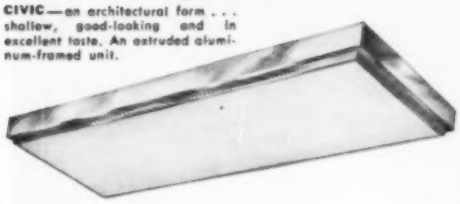
. . . the man from Smithcraft

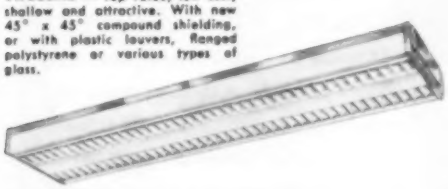
*George Kolbe, manager of Smithcraft's New York City team of Kolbe, Goren and Smith . . . part of the nationwide Smithcraft sales organization.

. . . 4 good NEW ideas in lighting

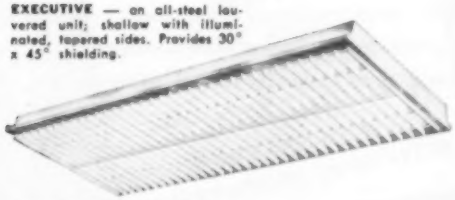
CIVIC—an architectural form . . . shallow, good-looking and in excellent taste. An extruded aluminum-framed unit.



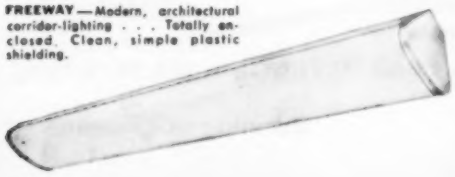
TWOSOME — Top value, low cost, shallow and attractive. With new 45° x 45° compound shielding, or with plastic louvers, Ranged polystyrene or various types of glass.



EXECUTIVE — an all-steel louvered unit; shallow with illuminated, tapered sides. Provides 30° x 45° shielding.



FREEWAY—Modern, architectural corridor-lighting . . . Totally enclosed. Clean, simple plastic shielding.



In addition to the CIVIC and the TWOSOME, Smithcraft's new developments include the EXECUTIVE and the FREEWAY. You'll find all four units useful to you in the planning of lighting for today's interiors.

He's the man whose experience and knowledge of lighting is backed by Smithcraft's highly diversified line of fluorescent lighting units. The "Man from Smithcraft" can suggest the new CIVIC, for example, for interiors requiring the very finest in "prestige lighting". Or he can turn to the brand new top value TWOSOME for general office, store or school lighting. Ask the man from Smithcraft to show you Smithcraft's "4 GOOD NEW IDEAS IN LIGHTING".

Wherever good lighting is important, you'll find . . .

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CHELSEA 50, MASSACHUSETTS

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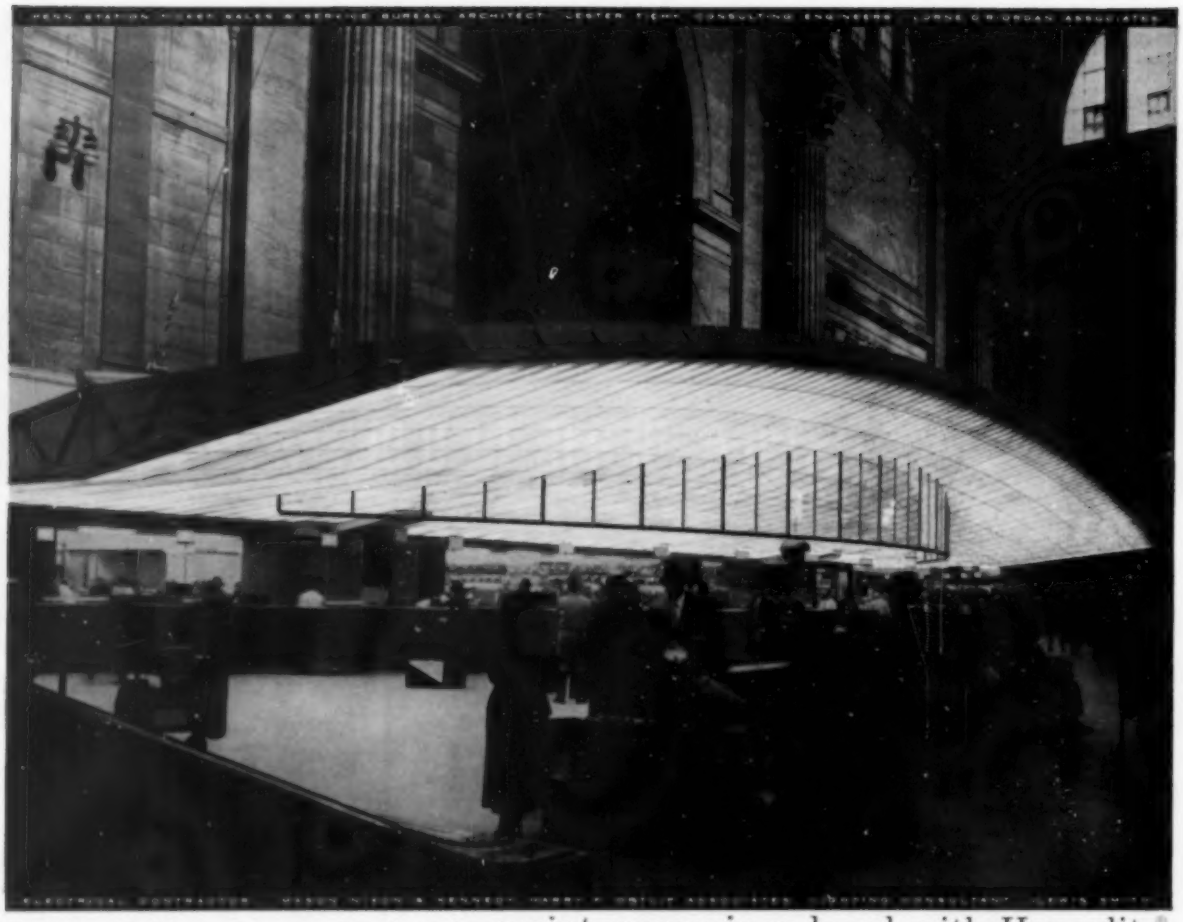
☐ Please send me the monthly publication, "Light Side of the News", so that I can keep in touch with the latest trends in lighting.

☐ Please send me folders and catalog sheets on the "4 Good New Ideas in Lighting"

☐ Please send me the complete SMITHCRAFT CATALOG, containing data on America's Finest Fluorescent Equipment.



Even in this big and busy railroad station **maintenance is reduced with Honeylite.**®

It takes an army of 200 men to keep New York's Pennsylvania Station clean. Every 24 hours they remove more than 25 tons of scrap paper, refuse and dust. An ordinary light-diffusing ceiling would be a maintenance headache with this amount of dirt and dust. Not so with Honeylite! This 7,000 square foot canopy of light over the Pennsylvania Railroad's new TV ticket sales counters means fewer hours of tedious and expensive cleaning time. Dirt and dust just fall through Honeylite's open hexagons. Furthermore, Honeylite is all-aluminum, which means that it is non-static, so it does not attract dust, nor does it require de-staticizing after handling. Removing smoke stains and grease from Honeylite under normal conditions is not difficult... rinse it off in ordinary detergent and put it back to air dry. And, of course, all this ease of maintenance is but one of Honeylite's advantages. For efficiency in diffusing soft, even light, for ease of installation, for glare elimination, and for beauty Honeylite is unexcelled.

See our Catalog in Sweet's file 21a/He

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LIGHT-DIFFUSING ALUMINUM HONEYCOMB
A DEVELOPMENT OF **HEXCEL PRODUCTS INC.**
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ALL NEW! Most versatile recessed lighting under the sun!

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NEW
light-tight
extruded aluminum
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shallower design!

NEW
glass, plastic
& metal shieldings*
glass to glass in continuous runs

plus **SAFE, LOW TEMPERATURE OPERATION**

standard one foot widths
plus 2 x 2, 2 x 4, 4 x 4

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General Electric says:

"On the average, only 1 out of every 1,000 G-E Fluorescent Lamps may not light."

C. C. Lawrence, operating manager, says:

"We installed 61,970 G-E Lamps and only 1 out of every 1,500 wouldn't light! That's 99.93% perfect!"

Owners: Galbreath Corporation—John W. Galbreath, Peter B. Ruffin

MR. LAWRENCE is the Operating Manager of the Socony Mobil Building—one of New York's newest and most dramatic skyscrapers—where nearly 62,000 G-E Fluorescent Lamps far exceeded the claims General Electric makes for them.

SPECIFY General Electric Lamps and your customers can expect the same *performance that exceeds the promise!* General Electric manufactures its lamps with such care and precision that, on the average, 999 out of 1,000 G-E Lamps are free of physical defects which could affect their performance in service. And this performance doesn't stop here. *Evidence: Only 373 of the 61,970 G-E Lamps needed replacing during the first full year of service. That's only 6 out of 1,000!* General Electric Co., Large Lamp Dept. IE-107, Nela Park, Cleveland 12, Ohio.

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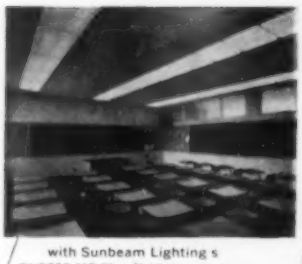
GENERAL ELECTRIC

G-E LAMPS GIVE YOU MORE FOR ALL YOUR LIGHTING COSTS

SCENE: THE COUNTRY OVER

"Tough-Nut" Illumination Problems Solved by Sunbeam Lighting!



with Sunbeam Lighting's DV3600-M7 2' x 4' Visionaires, recessed in suspended ceiling. For high level, comfortable illumination.

with Sunbeam Lighting's HSDP3800 4' x 4' large area, recessed, Plexiglas-shielded units. Architecturally integrated to enhance interior decor.

multi-level commercial garage with Sunbeam Lighting's 1901 Series open-type "antenna guard" Visionaires. Staggered-pattern installed for optimum general illumination.

with Sunbeam Lighting's HL3800 Series, large area, louvered, recessed Visionaires. High intensity, low brightness illumination. Balanced—for merchandise sales appeal.

with Sunbeam Lighting's 1100 Series, all-metal, luminous indirect, minimum-maintenance Visionaire. For demanding visual tasks.

Want the Full Story? Request Bulletins ZZ-10/1.

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SUNBEAM LIGHTING CO., INC., 3840 GEORGIA STREET, GARY, INDIANA

BETTER LIGHTING FOR BETTER VISION WITH VISIONAIRE LIGHTING FIXTURES

NEW EQUIPMENT DATA
AVAILABLE WITH COUPON

New manufacturers' catalogs and bulletins listed below are available free to readers of ILLUMINATING ENGINEERING by mailing the coupon. Circle the numbers of those items which you want, drop in envelope or fasten securely to back of 2-cent postcard addressed to Publications Office.

(1) FIXTURES FOR POWER GROOVE are described in Folder OD-685; new series of CFI-15, -20, -30 and 30L luminaires for industrial lighting. Eight-page, two-color folder gives complete specification, installation and illumination data and is well-illustrated. Day-Brite Lighting Inc., St. Louis, Mo.

(2) REFLECTOR FLUORESCENT LAMPS in new and expanded line are shown in four-page, two-color folder which summarizes 15 types now available and discusses and illustrates various applications as well as describing various features of the lamps. Sylvania Electric Products Inc., Salem, Mass.

(3) COMPLETE FIXTURE CATALOG of fluorescent, slimline and rapid-start luminaires contains 150 pages and includes photos and descriptions of company's complete line as well as lighting data and installation information. Light & Power Utilities Corp., Memphis, Tenn.

(4) SOUNDSHEET, new plastic laminate translucent acoustical element for overall lighting systems, is described in two-page, two-color catalog sheet which shows its use in such systems, whether in existence or in planning stage. Technical Data includes report of sound absorption test and other qualities. Contrex Co., Chelsea, Mass.

(5) LUMA CEILING, company's new illuminated ceiling lighting system, is described in 12-page illustrated booklet which shows wide variety of typical installations and effects to be obtained by use of several different bottom types; complete installation and specification data, as well as engineering information. Pittsburgh Reflector Co., Pittsburgh, Pa.

(6) BALLAST FOLDER, "Is the UL Label on a Ballast Really Enough for You?" outlines difference between UL listing on a ballast, which covers safety, and the CBM emblem, which is said to assure top lighting performance. Certified Ballast Manufacturers, Cleveland, Ohio.

(7) SQUARE BOWL CEILING UNIT with 4¼" projection is described in catalog page C-7 covers cast aluminum, weather-resisting construction and gives specifications, lighting data, and applications for outdoor locations. McPhilben Mfg. Co., Brooklyn, N. Y.

(8) OUTDOOR FLUORESCENT LUMINAIRES 204S and 406S are featured in Bulletins GEC-1460 and GEC-1462 which provide complete descriptions, discuss applications, and include luminaire electrical data, photometric data, dimension diagrams and recommendations for power groove or high output lamps. General Electric Co., Schenectady, N. Y.

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(9) GRID FIXTURE HANGER which is said to mount any fixture, cabinet or curtain wall to T bar grid without use of tools is described in catalog page which details SNAPEE No. 210 hanger and covers various features. Daniel Woodhead Co., Chicago, Ill.

(10) PANELAIRE, new large area luminaire, is featured in two-color, four-page folder, with separate page of illumination data, which gives full specification, construction and installation data on this versatile lighting unit, and includes ordering information. Lighting Products Inc., Highland Park, Ill.

(11) HOW TO SELECT FLOODLIGHTS, Bulletin GEA 6175A, in 16 pages discusses essential features of floodlight installation, operation, and application; provides product detail. In addition, publication gives general information on whole problem of floodlighting. General Electric Co., Schenectady, N. Y.

(12) WIRE CATALOG SHEETS, new and revised for company's wire and price catalogs, effective September 23, 1957, include descriptions and specifications as well as new prices for variety of wire and ribbon. Sylvania Electric Products Inc., Warren, Pa.

(13) OUTDOOR LUMINAIRES of new fluorescent type are shown in illustrated eight-page folder. Unit is designed especially for lighting poster panels, store fronts and walls and is available in small, extendable units for any length application. Folder furnishes full details of construction and application. Revere Electric Mfg. Co., Chicago, Ill.

(14) PARAWING & PARALUME, new line of fluorescent commercial luminaires, are described in four-page, two-color folder and four accompanying catalog pages which give full details of construction, installation, illumination characteristics and other important information. Day-Brite Lighting Inc., St. Louis, Mo.

(15) INSPIRATION LIGHTING is title of new catalog of commercial luminaires, including interior and exterior decorative and utilitarian units; is completely illustrated with lighting idea sketches in full color and technical lighting information to assist in planning installations. Moe Light Division, Louisville, Ky.

Area-lighting system of many moods welcomes office visitors at the New England Mutual Life Insurance Company

New Sylva-Lume wall-to-wall illumination

by Sylvania

You can custom-create ▲ lighting designs like this . . .

using a few standardized components like this ▲

Deep panels • 4 types. In pink, yellow tints, or white

Subtle dashes of color. A warm and pleasant mood. Ceiling décor that almost seems to extend a friendly, "Welcome."

In its own quiet way, new Sylvania *Sylva-Lume* brings all this mood, and good lighting too, to these Boston (Mass.) reception rooms of the New England Mutual Life Insurance Co. It helps also to separate various functional sections of the large room area.

Here New England Mutual uses only one of many possible ceiling designs. Actually, *one in over 100,000* . . . custom-created from a few standardized components . . . using a track grid system based on 36-inch modules. The existing designs can be changed overnight, if desired, by simply shifting the vinyl plastic panels and perforated metal baffles.

New *Sylva-Lume* is a lighting system of unlimited designs and moods, for the designing man of many moods. Developed by a creative group for a creative profession, it allows unlimited freedom of design. By organizing its elements of color, light and form, you can create desired pattern, texture, and style. *Write direct for folder of complete information.*

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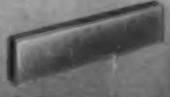
LIGHTING • RADIO • ELECTRONICS
TELEVISION • ATOMIC ENERGY

Shadow panels • 4 types. In some two tints, or white

Drumhead panels • 5 types. White, pink, yellow . . . in several pleasing combinations



Acoustic baffles— White, yellow or blue —delineate and accent

Perimeter panels— Interesting treatment for borders

why not try

EXTRU-LITE® PATTERN **R1**

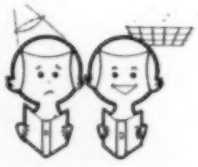
IN ACRYLIC (Plexiglas† and Lucite*) OR POLYSTYRENE

ITS LIGHTER THAN YOU THINK

. . . and that's the way it should be!

Like a room harmoniously decorated, where no one piece of decor strikes a discordant note, so fixtures using the new Extru-Lite Pattern R1, low brightness panel, supply light in abundance without drawing undue attention to its source.

With Extru-Lite Pattern R1, there is no distractingly bright glare, just an efficiently controlled light that surrounds you with a cheerful atmosphere.



R1 was purposely designed as a flat shield without a predominant direction, so that a high degree of visual comfort could be achieved without monotony by using any combination of 1′ x 2′, 1′ x 4′, 2′ x 2′, or 2′ x 4′ fixtures to create an interesting pattern of light. R1 gives one greater freedom in design layout.

Whether you are considering the development of your own exclusively created shield or are merely looking for a thoroughly competent supplier of "standard" type panels, you will find us ready to cooperate in confidence and to deliver as promised.

The Best Buy In Sight — Fixtures Using Extru-Lite

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INSTALLATION COSTS LESS...

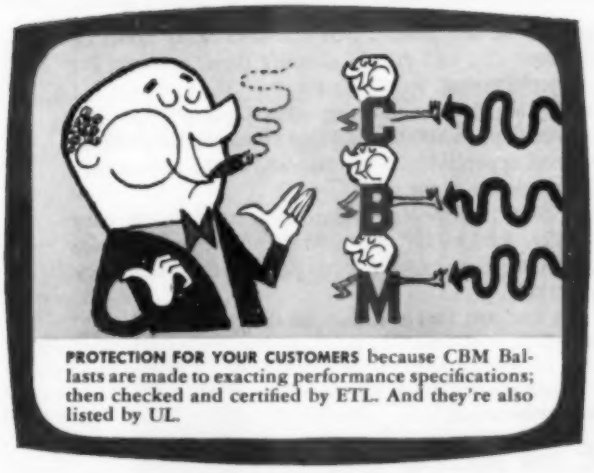
with fixtures using

Certified CBM Ballasts

KEEPS LABOR COSTS DOWN, TOO. (Low power factor can boost these costs as much as 65%.) CBM Ballasts mean fewer circuits, fewer man-hours needed.

SAVE ON WIRE COSTS—for High Power Factor in Certified CBM Ballasts saves your customers from expensive oversize wiring needed by low power factor equipment. Guards against penalty charges on light bills, too!

LONGER LIFE FOR CBM BALLASTS—because CBM specifications set a limit for temperature rise. This helps provide more efficient, longer, trouble-free service.



PROTECTION FOR YOUR CUSTOMERS because CBM Ballasts are made to exacting performance specifications; then checked and certified by ETL. And they're also listed by UL.

WRITE FOR CBM BOOKLET
"Why High Power Factor ballasts cut your lighting costs"

Seven leading manufacturers now make up

CERTIFIED BALLAST MANUFACTURERS

2116 KEITH BUILDING • CLEVELAND 15, OHIO

Participation in CBM is open to any manufacturer who wishes to qualify

CBM-4-E

IT'S A SNAP!... to install PITTSBURGH'S NEW "SEE-WAY" LUMINAIRE

GENERAL CHARACTERISTICS

The SEE-WAY is an All-White 2-lamp direct-indirect luminaire for surface or pendant mounting. It's made of highest quality electrical components. All parts are die-formed of 20-gauge sheet steel; prefinished by the Parker Bonderite iron phosphate process for corrosion resistance. Comes in 4 and 8 foot sections.

PLASTIC SIDE PANELS "SNAP" INTO PLACE

Here is a brand new feature that will save many hours of installation time . . . and greatly simplify panel removal for cleaning or replacement.

Side panels are flexible diffusing ribbed polystyrene . . . easy to handle, ship, and maintain. Light in weight, they reduce the ceiling load appreciably. They also add to the appearance and overall efficiency of the unit.

The light from the See-Way is glare-free, comfortable, easy to work under. Perfect for classrooms, offices, or wherever visual comfort is necessary to maintain peak working efficiency over long periods.

See-Way's low cost makes it easy on the budget too!

For other advantages on the SEE-WAY you ought to know about,

WRITE **FOR BULLETIN M-11.**

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Lighting Engineers in All Principal Cities

PITTSBURGH LIGHTING EQUIPMENT IS DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE

True color was the goal in this 40'x28' building for Kallenbach Florist, Erie, Penn. 96 four-foot, 40 watt units are wired in three groups for individual control of lighting in separate areas. Eight months after installation, 65 foot-candles are being obtained. "Panel-Glo" Ceilings by Benjamin Electric Mfg. Co., Des Plaines, Ill.

Here's how ceilings made of BAKELITE Rigid Vinyl Sheet...

make sales blossom

Beauty needs the proper setting...and life-like lighting makes a difference in this florist's sales. Here, the soft, unobtrusive light shows the flowers in their natural colors.

Display rooms, offices, homes all benefit when translucent ceiling panels are made from BAKELITE Rigid Vinyl Sheets. This material resists cracking, warping and discoloration. It is normally unaffected by moisture, corrosion, and being light in weight, BAKELITE Rigid Vinyl Sheet is easy to install, easy to remove, easy to maintain.

For your next job...new building or modernization...consider the many advantages of ceiling lighting. For complete information, write Dept. ZW-82.

BAKELITE
BRAND
PLASTICS

UNION CARBIDE

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

The terms BAKELITE, UNION CARBIDE and the Trefoil Symbol are registered trade-marks of UCC.

Pleasing Low Brightness Lighting for Bank Customers, Personnel and Management — by LITECONTROL

To give you an idea of the efficiency of this lighting installation, the photographer who took the picture found it unnecessary to use any auxiliary lighting. *Yet there's no glare!*

The brightness is very, very low, puts no strain on the eyes, eases paper work (and minimizes errors) by customers and the bank staff and provides a very comfortable interior. The high efficiency of the illumination is proved by the intensity levels reached with 3-lamp fixtures.

This is another example of good functional lighting supplied by *standard*, cost-saving LITECONTROL fixtures. It happens to be a bank installation but it could be a school, office, store or plant — all of which are currently benefiting by LITECONTROL equipment — everywhere.

INSTALLATION:
Winchester Trust Company, Winchester, Mass.
AREA SHOWN: General bank area.
ARCHITECT:
Hutchins & French, Boston, Mass.
ELECTRICAL ENGINEER:
Cleverdon Varney & Pike, Boston, Mass.
ELECTRICAL CONTRACTOR:
Barges Electric Co., Watertown, Mass.
FIXTURES:
Litecontrol No. 8334RS 3-lamp recessed fixtures, using Holophane No. 6024 acrylic lenses, and 3 special No. 8384RS 8-lamp recessed 4' x 4' fixtures with No. 6024 lenses.
CEILING HEIGHT: 10'-0".
FIXTURE SPACING: 8'-0".
INTENSITY:
95 foot-candles average on top of tellers' counters;
85 foot-candles average throughout room, at working level.

LITECONTROL *Fixtures*

KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

American Type Founders Co., Inc. saves $6050 every two years at their modern main plant in Elizabeth, New Jersey . . . uses Sylvania's Group Replacement Plan to change over 11,000 lamps and overhaul over 5,000 fixtures.

$6050 saved regularly by American Type Founders with Sylvania's Group Replacement Plan

American Type Founders Co., Inc. estimate a regular saving of $6050 over former lamp replacement and fixture maintenance costs with Sylvania's Group Replacement Plan.

This major saving is on labor alone—employed to change over 11,000 Sylvania fluorescent lamps and to completely recondition over 5000 fixtures *every 2 years*. ATF also enjoys the additional advantages of greater lighting efficiency, increased production, less work interruption, and improved employee morale.

These major lighting economies are largely due to the service life, the quality, and the improved maintained brightness of Sylvania fluorescent lamps.

For example, when ATF initiated their Sylvania Group Replacement Plan, lamps were changed annually. ATF found that in actual operation Sylvania fluorescent lamps were exceeding their Rated Life of 7500 hours, because of the minimum on-and-off cycles in effect. Consequently, it became possible to adopt a 2-year replacement plan. Burnout records showed a rate of less than 20% over a two-year period!

Your local Sylvania Representative will be glad to discuss your plant or office lighting equipment and maintenance practices. Without obligation, he will demonstrate how you, too, can cut lighting costs with the right lamps—selected from Sylvania's complete line of fluorescent, incandescent and mercury-vapor lamps—and a Group Replacement Plan based on your particular requirements.

Call your Sylvania Representative, or send today for a Free booklet about the practical and important economies of a Sylvania Group Replacement Plan.

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, 60 Boston Street, Salem, Mass.
In Canada: Sylvania Electric (Canada) Ltd.
Shell Tower Building, Montreal

SYLVANIA

...the fastest growing name in sight!

LIGHTING • RADIO • ELECTRONICS
TELEVISION • ATOMIC ENERGY

—MAIL COUPON TODAY—

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Dept. 7L-3510, Salem, Mass.

Gentlemen: I'd like to know more about the Sylvania Group Replacement Plan and how it can cut lighting costs.

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

BY ZEUS!

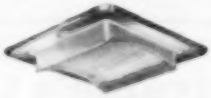
these Guth brascolite incandescent fixtures are TOPS!

SQUARE RECESS UNITS
with Holophane and Corning lenses for Intensive, Diffusing, Concave, Convex, Focusing and Asymmetrical distributions.

SILVER BOWL DIFFUSING fixtures in 4′ x 4′ and 2′ x 4′ sizes with the amazing GRATELITE Louver Diffuser*.

ALZAK PIN-HOLE RECESS LIGHTS
For intense downlighting—100 watt to 1000 watt sizes in General Service and Silver Bowl lamp types.

THE ROTATORS
Both EYEBALL (shown) and CONCEALED rotator. Adjustable recess downlites for PAR and R-lamps.



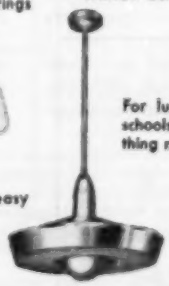
CORRIDOR PRISMATIC RECESS FIXTURES
Three types for 2½:1 and 1:1 ratios.

LONG BOY ELLIPSE
Surface luminaire
(also available in recess units). Gives narrow, high intensity beam for indoor or outdoor mounting, or for accent lighting.

ROUND CONCAVE RECESS
Also available with Flat or Prismatic glass, and with metal concentric rings or open types.

BABY RECESS LIGHTS
For directional markers, night lights, other minimum intensity installations. Narrow beam or drop-lens types.

ALZAK HINGED GLASS Drum Units
Hinges on concealed chain for easy relamping and cleaning.



GRATELITE INDIRECT
Pendant Type
For luminous indirect lighting in schools, stores and offices. Something new . . . and beautiful!

*GRATELITE Louver Diffuser® U. S. Pat. No. 2,745,001. Canadian Patented 1957, No. 538,243.

These and many, many more incandescent fixtures are included in this new Brascolite Catalog by Guth. A complete working tool, it contains all information needed to figure any incandescent lighting job.

Write on your letterhead for your complimentary copy.

THE EDWIN F. GUTH COMPANY
2615 Washington Blvd. • St. Louis 3, Mo.

Behold! My New Name:

SEEMORE

In response to my pleas for a name, many splendid suggestions were presented. After much thoughtful consideration, I have chosen the name "Seemore", submitted by

MR. WILLIAM J. MAGILL
Lighting Consultant
Southern California Edison Co.
P. O. Box 410
Long Beach 1, California

To Mr. Magill, and to the others listed below, whose suggestions were also deemed worthy of reward, I am dispatching a bottle of Metaxa—that most excellent Greek brandy. My warmest thanks to all of you who so kindly assisted in my quest for a name.

MR. A. E. BRUNER
Lighting Specialist
The Electric Supply Co.
128 Walton St., N.W.
Atlanta, Georgia

MR. R. S. SMITH
Consulting Engineer
3230 Ave. "J"
Fort Worth, Texas

MR. JACK PARSONS
Illuminating Engineer
Niagara Mohawk Power Corp.
Buffalo 3, New York

MARY MacD. TRACY
Eaton W. Tarbell & Assoc., Inc.,
Architects
173 Exchange St.
Bangor, Maine

Guth brascolite
THE EDWIN F. GUTH COMPANY
2615 Washington Blvd. • St. Louis 3, Mo.

(*Continued from page* 15A)

Student Membership Committee Established

At its meeting in Atlanta last month, Council established a new committee on Student Membership to have a broad scope for increasing student membership in I.E.S., establishing Student Branches where feasible, and in general developing advantageous liaison between I.E.S. and the students and faculty of electrical engineering, illumination, architecture and other related studies. Professor John O. Kraehenbuehl was appointed chairman. The new committee developed from studies recently completed by a Task Committee of Student Branches, Walter Sturrock, Chairman, who presented their final report and recommendations to the Atlanta Council.

Certified Lighting Program Issues Printed News Letter

Lighting tips which have worked for other electrical contractors are attractively set forth by the Certified Lighting Bureau, in a four-page printed folder mailed regularly. Titled the *Interchanger*, the publication is available from the National Lighting Bureau, 155 East 44th Street, New York, N. Y., or from any local Certified Lighting Bureau. Successful tips are also solicited, with a sterling silver tie clip offered for suitable suggestions for selling quality installations.

New York Chapter, A.I.D. Becomes N.S.I.D., Inc.

The New York Chapter of the American Institute of Decorators, Inc., announces change of the name to the National Society of Interior Designers, Inc. Headquarters of the organization are at 50 East 57th St., New York 22, N. Y.

ABOUT PEOPLE

Two executives of the Crouse-Hinds Co., Syracuse, N. Y., have been promoted to jobs of greater responsibility. **Albert H. Clarke,** former Vice-President for Engineering, has been named Vice-President for Manufacturing. Succeeding him in his old post is **Russell P. Northup,** formerly Commercial Vice-President for Condulet Sales, who will supervise the company's product research and development programs.

Appointment of three regional sales managers for its Chicago, Eastern and Southwestern regions has been announced

(*Continued on page* 44A)

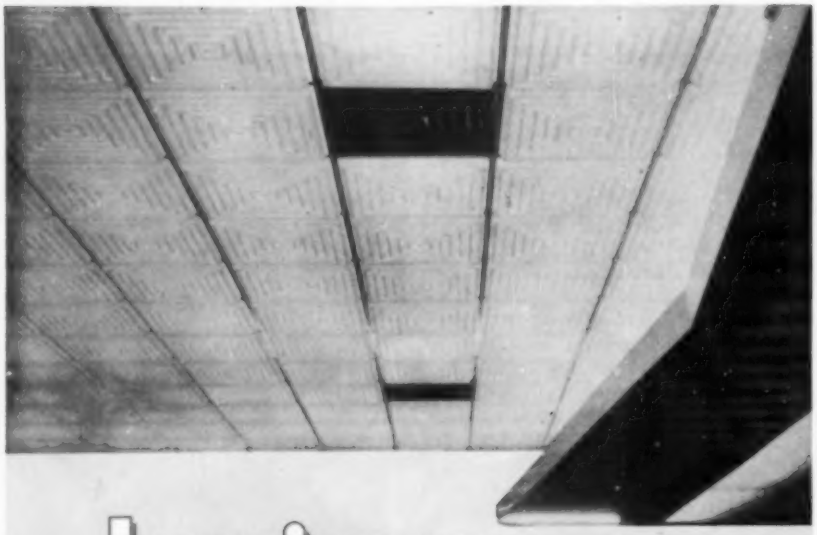
IDENTITY

Like fingerprints, lighting units may look alike. But careful examination shows great differences. Kurt Versen fixtures are truly individual because their many patented features assure easier, lower cost installation, superior performance, trouble-free maintenance, and—satisfied customers.

Competitively priced and you can depend upon our prompt delivery.

Write for our catalog.

kurt Versen
company
contemporary lighting
Englewood 6, New Jersey



Luminous Ceilings

Put Business in a Better Light

Luminous ceilings are the newest lighting tool . . . remarkably comfortable, efficient, and economical. But their application, design and installation take "know-how" and experience. You've got to know what to do . . . and what not to do.

That's why it will pay you to consult Light & Power Utilities Corp. before you order. You'll find at L & P "one stop does it all"—your prime source for the fixtures you'll need . . . an abundant stock of ceiling material . . . plus worlds of experience as a leading manufacturer of fluorescent fixtures.

Ceiling Division, Contracting Department

Distributed by Electrical Wholesalers Only

LIGHT & POWER UTILITIES CORP.

Write or wire today for catalog and prices.

LIGHT & POWER UTILITIES CORP.

Putting Business in a Better Light

1033 FIRESTONE BLVD. • MEMPHIS, TENNESSEE

(Continued from page 43A)

by Curtis Lighting Inc. **Frank J. Bernd** has been named to the Chicago region, with headquarters at the company's plant, 6135 W. 65th St. **Fred A. Stewart** will manage the Eastern region from the firm's New York City office at 60 E. 42nd St. **Earl I. Dinsmore,** as manager for the Southwestern region, will be located at 4723 N. Central Expressway, Dallas, Texas.

Three new appointments in the Lighting Sales Department have been announced by Corning Glass Works. In a newly created position, **William F. Crosby** will serve as field sales manager of the department. **Clarence W. Clarkson** and **Arthur R. Jaeger** have been appointed product specialists, Mr. Clarkson for commercial lighting applications and Mr. Jaeger for street lighting and residential lighting.

Election of **Edward H. R. Blitzer** as president of the American Home Lighting Institute, Chicago, has been announced. Mr. Blitzer, president of Lightolier, Jersey City, N. J., succeeds **Robert W. Minett, Jr.,** marketing director of the John C. Virden Co., Cleveland, who had served two one-year terms. Vice-Presidents elected are **Alfred M. Rosenblatt,** executive vice-president of Globe Lighting Products, Inc., Brooklyn, N. Y.; and **H. Leslie Gould,** assistant to the president of Imperial Lighting Products Co., Latrobe, Pa. **Eugene Berman,** president of Leader Lamp Mfg. Co., New York, was elected secretary.

The Artopoeus-Smith Co., Box 145, Bay Village, Ohio — principals, **John Artopoeus** and **William Smith** — is now representing McPhilben Lighting Co. in northern Ohio. They are replacing Louis Wagner, who recently passed away.

John B. Munson has been named sales manager of wiring devices for the Bryant Electric Co., a wholly owned subsidiary of Westinghouse Electric Corp. Mr. Munson replaces **Clyde W. Foster,** who at his own request has been transferred to Chicago as manager of the midwestern region.

Chas. K. Ramond Co., manufacturers representatives, 1021 Carondelet Bldg., New Orleans, announce the appointment of **D. W. Hawkins** as lighting specialist. Mr. Hawkins will cover the states of Louisiana and Mississippi and the cities of Mobile and Pensacola.

Luminous Ceilings Inc. has added five representatives to its sales force. These are **W. J. Childers,** 6530 Tulip Lane,

(Continued on page 46A)

Lighting Standards and Sign Spans by P & K blend into that pleasant "Florida Look" on the Sunshine State Parkway

An outstanding example of distinctive design and far-sighted planning, the Sunshine State Parkway may well be a model for many future traffic arteries.

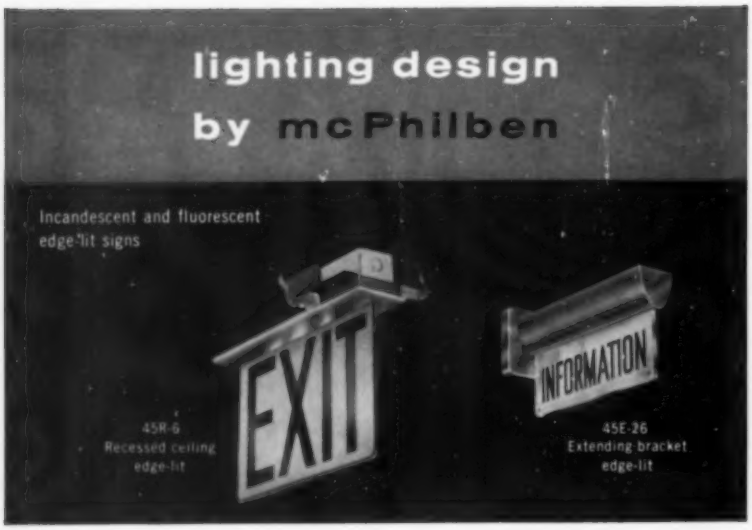
From start to finish, the accent was on beauty, safety and economy, generously sprinkled with welcomed originality.

Naturally, modern thinking demanded modern materials. Clean, bright, lightweight and strong P & K aluminum products were specified and installed wherever possible... from lighting standards to over-the-road sign spans. No rust, no painting, high resistance to corrosion... and no maintenance, despite the characteristic sea air of healthful Florida.

Write for the latest P & K catalogs on highway lighting and traffic control products... and use the P & K planning and advisory services without obligation.

P&K PFAFF & KENDALL
84 Foundry St., Newark 5, New Jersey

P & K SEAMLESS TAPERED ALUMINUM LIGHTING STANDARDS ARE INSTALLED AT ALL INTERCHANGES AND SERVICE AREAS. P & K SIGN SPANS HELP GUIDE MOTORISTS ALONG ENTIRE PARKWAY.

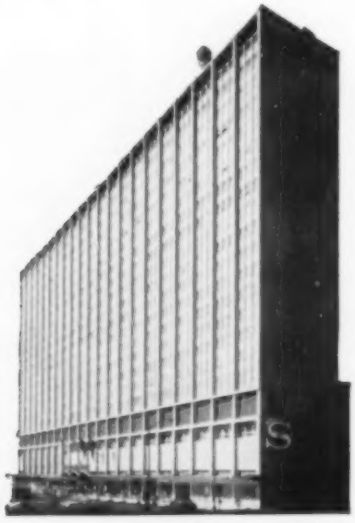


CAST ALUMINUM QUALITY

The gleaming satin finish of these mcPhilben directional units will blend with the interior door and window frames of the handsome new Philadelphia Sheraton Hotel. Invisible hardware permits flush installation so necessary to streamlined modern decorating. Solid cast aluminum construction assures permanent maintenance-free operation. Hinged access doors provide for easy relamping.

Most mcPhilben directionals are available in white, red and green color combinations with a range of lettering sizes to meet all fire code regulations. Auxiliary lampholders suitable for proper circuiting of emergency lighting systems may be specified.

Ask your mcPhilben representative for individual specification sheets. Consult Sweet's Architectural File $\frac{31a}{Mc}$ or write to mcPhilben Lighting Co., 1329 Willoughby Avenue, Brooklyn 37, N.Y.



Philadelphia Sheraton Hotel

Another Outstanding Building Featuring mcPhilben Lighting

Architects: Perry, Shaw, Hepburn & Dean; Electrical Contractors: Keystone Engineering Corp.
Engineers: Slocum & Fuller; Distributor: Standard Wholesale Supply Corp.

(*Continued from page* 44A)

Dallas, Texas; **R. A. Putterman,** 4101 San Jacinto, Houston, Texas; **William Frank,** 520 Hyman Dr., New Orleans, La.; **L. S. Reed** & Co., 1108 Lawrence St., Denver, Colo.; and **John G. Gaines** and **John G. Gaines, Jr.,** 435 Westport Rd., Kansas City, Mo.

Don Herdrich and **George Charuhas,** formerly with Efengee Electrical Supply Co., announce the formation of Queens-Lite, Inc., with offices at 316-318 N. Lake St. Mundelein, Ill., wholesale lighting distributors in upper Illinois and lower Wisconsin.

Dr. William L. Everitt, dean of the College of Enginering of the University of Illinois has been awarded the American Institute of Electrical Engineers' Medal in Electrical Engineering Education, for outstanding service as a teacher in the field. Dean Everitt received the honor at the Fall General Meeting of A.I.E.E. October 7.

John S. Kinnaird has been named Lighting Division Manager of the National Electric Supply Co., distributors in San Francisco, Santa Rosa and San Carlos, Calif.

Deaths

David B. Kopp, New England Section.
Bert W. Stiles, Rocky Mountain Section.

BOOKS AND PAMPHLETS

Encyclopedia of American Associations, published by Gale Research Co., 1116 Book Tower, Detroit 26, Mich. $15 with supplements.

A supplement to the directory of associations has just been issued, listing 900 national associations, societies, organizations and labor unions. These listings bring to a total of 5947 the number of organizations covered. Each listing includes the national headquarters, executive secretary, number of members, founding date, and a brief description of the activities and purpose.

Product Research and Development, published by the Franklin Institute Laboratories, Benjamin Franklin Parkway at 20th, Philadelphia 3, Pa. No charge.

This 20-page booklet describes the services offered by the Franklin Institute Laboratories in product research and development, listing specific areas in which they are staffed and equipped.

Requests for copies should be on company letterhead to the Manager of Information Services Dept.

Industrial Plastics Fabrication, available from the L. A. Darling Co., Plastics Division, Coldwater, Mich. No charge.

This presentation booklet and plastics material guide features graphic examples of plastic fabrication methods with illustrations of the type of products best suited to each method. A chart gives the characteristics of rigid thermoplastics.

Light Up and Get More Fun Out of Life, published by Channing L. Bete Co., Inc., Box 506, Greenfield, Mass. Single copy, 15c; quantity prices from 10c to 7c varying with quantity.

This 16-page home lighting pamphlet is intended for consumer distribution as an all-purpose introductory booklet for mailings, meetings and advertising media.

Should Your Child Be an Engineer, available from the New York Life Insurance Co., Public Relations Department, 51 Madison Ave., New York 10, N. Y. No charge.

This booklet is by T. Keith Glannan, president of Case Institute of Technology, as told to Oscar Schisgall. It discusses the opportunities in engineering and the aptitudes required for a successful career in the field.

Help Yourself to Lighter Desk Work, available from Westinghouse Electric Corp., Lamp Division, P. O. Box 388, Bloomfield, N. J. Single copies, no charge; quantities at $1.50 per 100.

This folder illustrates various methods of lighting desk and table areas for students' homework. It contains 13 photographs showing right and wrong lighting arrangements and sketches of various types of portable reading lamps with measurements of proper distances.

The Closing College Door, published by the Council for Financial Aid to Education, Inc., 6 East 45th St., New York 17, N. Y. Single copies free.

This booklet outlines the problems and causes of overcrowded classrooms and laboratories, makes predictions for the future and suggests ways to ameliorate the condition.

Footcandles in Modern Lighting Practice, available from the General Electric Co., Large Lamp Dept., Cleveland 12, Ohio.

This 16-page booklet discusses the higher levels of illumination prevalent in commercial and industrial areas today, and gives suggestions on lighting levels for various types of interior and exterior installations.

new way to assure perfect illumination . . . specify formed

VINYL Light Diffusing **PANS**

available from leading fixture manufacturers *

Formed Vinyl Light Diffusing Pans offer many advantages over all other commonly-used shielding materials. More and more manufacturers are using these Pans in their lighting fixtures. Here are the reasons why:

UNIFORMITY. Chief among these is the fact that formed Vinyl Pans are completely uniform — assuring even light transmission over flat and curved areas. Uniformity as to color is also assured. Formed Vinyl Pans show *no change in color* after many years of service.

SAFETY. Formed Vinyl Pans are UL-listed for use under sprinklers. They will not support combustion, and will soften and fall out well in advance of sprinkler release temperature of 165°F.

COST ADVANTAGES. Expensive dies are eliminated by the forming process and an almost limitless number of designs can be produced with extreme economy.

new! **FREE** miniaturized **SAMPLES** of formed **VINYL** light diffusing pans

See for yourself! Check the uniformity of light transmission and color, the typical designs possible, in these 4 miniaturized sample Pans. Simply fill out and attach coupon below to your letterhead to request these free samples.

Pistle Division Pioneer Plastics 26 Howley Street, Peabody, Mass.

☐ Please send me the 4 miniaturized samples of formed Vinyl Light Diffusing Pans, and a listing of fixture manufacturers who offer Pans of this type.

name_____ title_____

company_____

address_____ state_____

city_____

*Complete list of fixture manufacturers offering formed Vinyl Pans available.

In lighting a religious edifice, the light meter is almost useless... Because here it is obvious that emotional effect—the feeling you create—is more important than footcandles. (Century's lighting instruments are engineered to meet the necessities of creative work.)

CENTURY LIGHTING, INC.

521 WEST 43rd ST.
NEW YORK 36, N. Y.
1820-40 BERKELEY ST.
SANTA MONICA, CALIF.
1477 N.E. 129th ST.
N. MIAMI, FLORIDA

I.E.S. Local Officers

(*Continued from page* 26A)

San Jose Chapter — South Pacific Coast Region

Chairman — M. G. HERBERT, P. O. Box 1153, San Jose, Calif.
Secretary — GEORGE C. SMEDBERG, Westlite, P. O. Box 1033, Redwood City, Calif.

Southeast Florida Section — Southeastern Region

Chairman — FRED W. MARKLAND, Graybar Electric Co., 2111 N. W. 22nd Ave., Miami, Fla.
Secretary — FRANK A. YANAROS, Florida Power & Light Co., 400 S. W. 2nd Ave., P. O. Box 3311, Miami, Fla.

Southern California Section — South Pacific Coast Region

Chairman — ROY E. BEVAN, Sylvania Electric Products Inc., 6505 E. Gayhart St., Los Angeles, Calif.
Secretary — FRANK B. LEE, General Electric Co., 2747 South Malt Ave., Los Angeles, Calif.

Southern Colorado Chapter Inter-Mountain Region

Chairman — LESTER JOHNSON, Pueblo Electric Supply Co., 131 Spring St., Pueblo, Colo.
Secretary — WILLIAM STULTZ, Southern Colorado Power Co., 613 Main St., Canon City, Colo.

Suwannee River Chapter — Southeastern Region

Chairman — RAY A. MCMICHAELS, Georgia Power & Light Co., Valdosta, Ga.
Secretary — ARTHUR T. CRABTREE, Union Electric Supply Co., 207 W. Hill Ave., Valdosta, Ga.

Tar Heel Section — Southeastern Region

Chairman — JAMES J. CARDO, Independent Electric Supply Co., Inc., 220 W. 1st St., Charlotte, N. C.
Secretary — T. LLEW CORDLE, J. N. Pease & Co., 119½ E. 5th St., Charlotte, N. C.

Tennessee Valley Section — South Central Region

Chairman — HARRY BOURGEOIS, 1805 Hayes St., Nashville, Tenn.
Secretary — JAMES DON HARRIS, Nashville Electric Service, 1214 Church St., Nashville, Tenn.

Toronto Section — Canadian Region

Chairman — JOHN M. CHORLTON, Toronto Board of Education, 155 College St., Toronto, Ont.
Secretary — R. P. LINDSAY, Canadian Line Material Inc., 3595 St. Clair Ave. E., Toronto, Ont.

Twin City Section — Midwestern Region

Chairman — G. WILLIAM FREDERICK, General Electric Co., 500 Stinson Blvd., Minneapolis, Minn.
Secretary — JOHN C. NEWHOUSE, Northern States Power Co., 15 S. 5th, Minneapolis, Minn.

Twin Ports Chapter — Midwestern Region

Chairman — PARKER LOWELL, Minnesota Power & Light Co., 30 W. Superior St., Duluth, Minn.
Secretary — D. A. HILGER, Graybar Electric Co., 1730 W. Michigan St., Duluth, Minn.

Utah Section — Inter-Mountain Region

Chairman — FREDERICK C. BATES, Bates Engineering Co., 10 S. Main St., Salt Lake City, Utah.
Secretary — ROBERT C. EVANS, 110 Social Hall Ave., Salt Lake City, Utah.

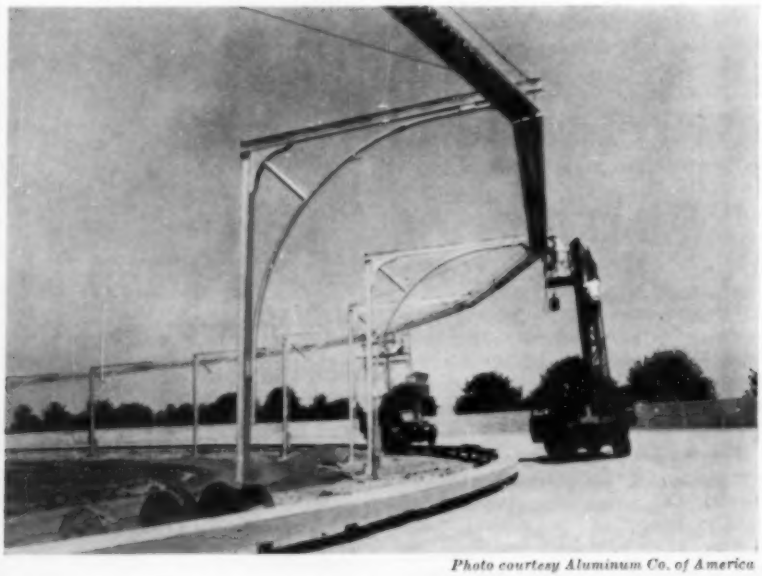


Photo courtesy Aluminum Co. of America

PREPARING for the trotters and the pacers. The current season at Roosevelt Raceway, Long Island, N. Y., is conducted under 100 footcandles on the track. Lighting system uses inverted aluminum troughs, and was designed by Adam Kopf of Sears & Kopf, Consulting Engineers.

Vancouver Island Chapter — Pacific Northwest Region

Chairman — JOHN MORRISON, Simpson & McGregor, 1010 Longley St., Victoria, B. C.
Secretary — WALTER E. BEEK, B. C. Electric Co., Ltd., 820 Pandora Ave., Victoria, B. C.

Virginia Section — East Central Region

Chairman — J. SHELTON RAGLAND, Virginia Electric & Power Co., P.O. Box 1194, Richmond, Va.
Secretary — WARREN G. CORNELIUS, 5802 Riverside Drive, Richmond, Va.

Western Michigan Section — Great Lakes Region

Chairman — D. A. HARPER, General Electric Supply Co., 305 Fulton, W., Grand Rapids, Mich.
Secretary — LEWIS L. NURNBERGER, Consumers Power Co., 821 Hastings St., Traverse City, Mich.

Western New York Section — Great Lakes Region

Chairman — LEO P. GAUTHIER, Sylvania Electric Products Inc., 407 Jackson Bldg., Buffalo, N. Y.
Secretary — WILLIAM P. ACKENDORF, Niagara Mohawk Power Corp., 535 Washington St., Buffalo, N. Y.

Winnipeg Chapter — Canadian Region

Chairman — D. A. BUCKLER, Green, Blankenstein, Russell, Assoc., 222 Osborne St., North, Winnipeg, Man.
Secretary — HAROLD GOODMANSON, 65 Dewdney St., Winnipeg, Man.

Yankee Chapter — Northeastern Region

Chairman — JOHN K. FRENCH, Electric Supply & Repair Co., 164 Wahconah St., Pittsfield, Mass.
Secretary — BART. D. BARRY, JR., Western Mass. Electric Co., 65 State St., Springfield, Mass.

I.E.S. Technical Committees

(*Continued from page* 20A)

Guide for Photometric Testing of Floodlights of 10-160° Beam Spread

J. S. Franklin, Chairman, General Electric Co., Outdoor Lighting Dept., Hendersonville, N. C.

Guide for Photometric Testing of Fluorescent Lamps

A. W. Weeks, Chairman, Champion Lamp Works, 330 Lynnway, Lynn, Mass.

Guide for Photometric Testing of Fluorescent Luminaires

G. A. Horton, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland, Ohio.

Guide for Photometric Testing of Outdoor Fluorescent Luminaires

J. S. Franklin, Chairman, General Electric Co., Hendersonville, N. C.

Guide for Photometry of Searchlights

A. E. Krawcek, Chairman, Crouse-Hinds Co., Syracuse 1, N. Y.

Guide for Reporting Lighting Equipment Engineering Data

E. H. Witte, Chairman, Benjamin Electric & Mfg. Co., Des Plaines, Ill.

Guide for Use of Photoelectric Portable Photometers

G. A. Horton, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland, Ohio.

"Sure, I put in CHAMPION Fluorescents ...A good job deserves the best lamps"
CHAMPION FLUORESCENT LAMPS
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CORRECTION

In the Litecraft Manufacturing Corp. ad which appeared on 50A in our September issue, the correct credits for the Roosevelt Raceway installation should have read: architect, Arthur Froehlich, A.I.A.; electrical contractor, Fishbach & Moore, Inc.; general contractor, Geo. A. Fuller Co.

Look For The Label

identifying Manning lighting. It means the design is original, the fixture was manufactured to finest engineering standards, the basic materials and finish were made for lasting satisfaction.

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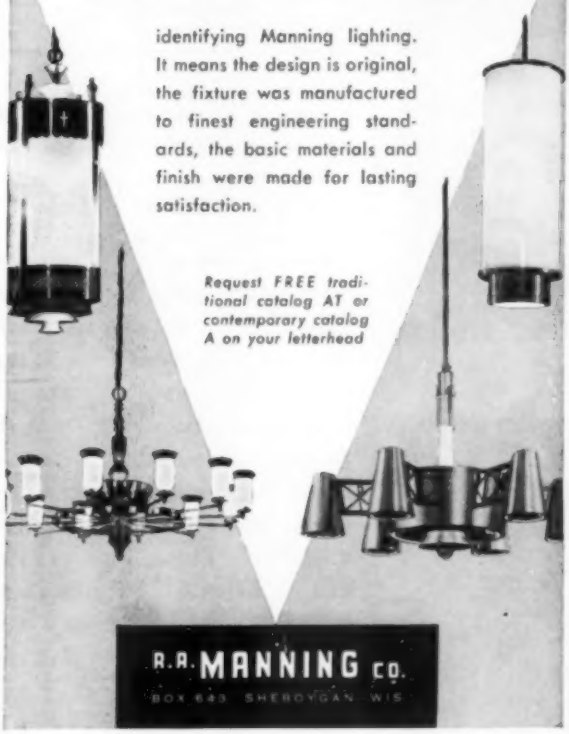

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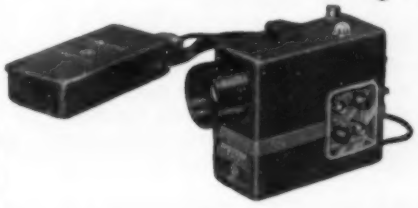

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There are three Abolite uplight units for high bay lighting: 18" and 24" diameter Alzak fixtures for use with 400 and 1000 watt mercury lamps and 18" Alzak fixtures for 500 watt incandescent lamps (ideal for gymnasium lighting). For full details, write Abolite Lighting Division, The Jones Metal Products Co., West Lafayette, Ohio.

ABOLITE *Lighting*

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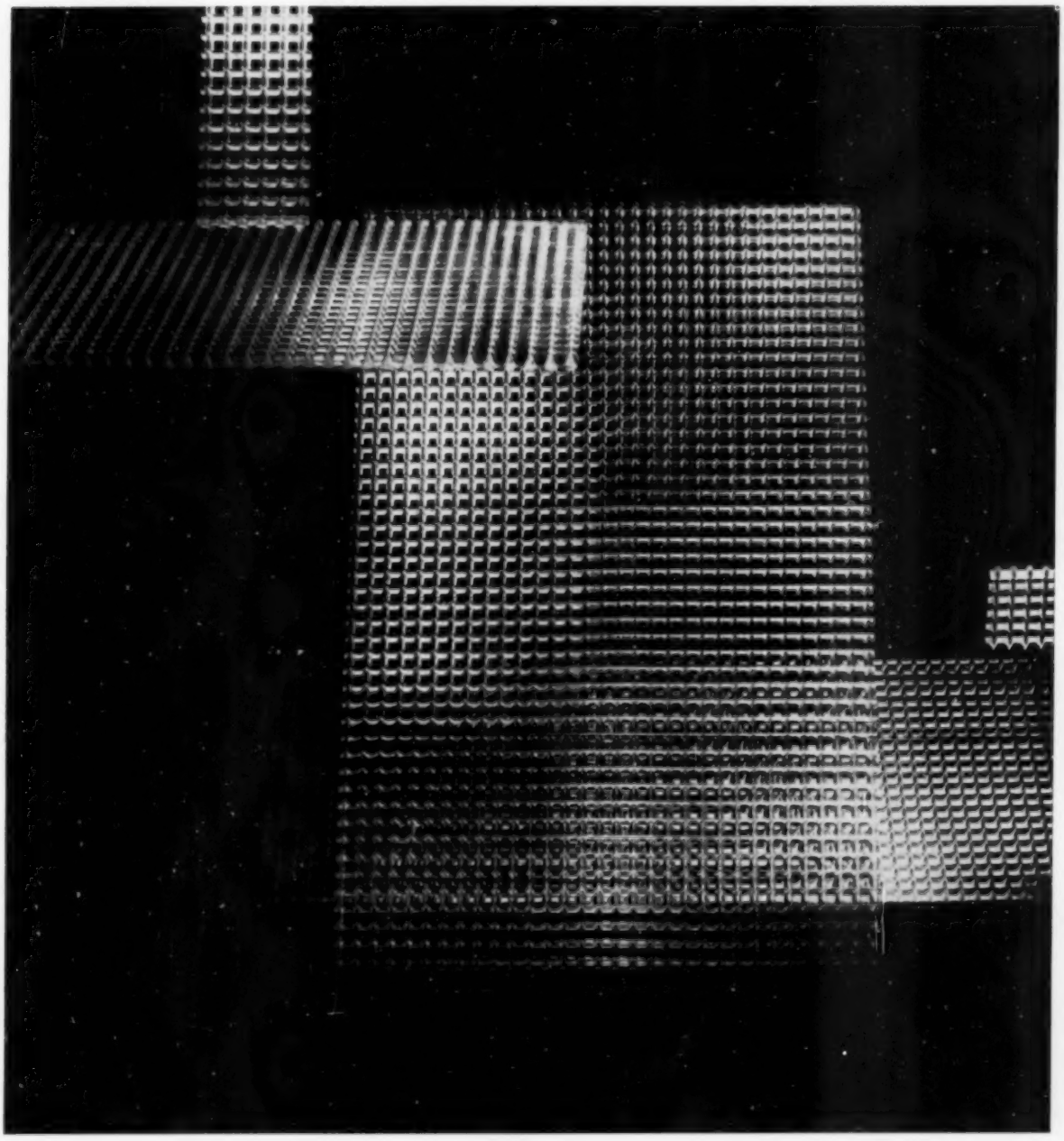

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